ESTONIAN UNIVERSITY OF LIFE SCIENCES

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POST-SOVIET, POST-MINING AND POST-AGRICULTURE LANDSCAPE WIND PARKS IN ESTONIA: DISPLAYING REGIONAL PRIDE AND BEING POSSIBLE TOURIST ATTRACTION

PIIRKONDLIKU UHKUSE KUVAMINE JA TURISMIATRAKTSIOONI VÕIMALIKKUS KOLME EESTI TUULEPARGI NÄITEL: ENDISES NÕUKOGUDE LIIDU, KAEVANDUSJÄRGSES JA ENDISES PÕLLUMAJANDUSMAASTIKU TUULEPARGIS

Master's thesis

Curriculum in Landscape architecture

Supervisor: Friedrich Kuhlmann, *MSc*

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The aim of the thesis is to find out if people have seen or lived nearby wind turbines. Also, how they spend their free time in their area and do they like the landscape in their region. Aim is to find out if people are proud of their region and do they consider wind farms as an aesthetical part of the landscape. Important is to find out how people feel about wind turbines which are built in their region. Also, is there a need for developing tourism and its facilities in their area. A questionnaire is carried out to the people from Harjumaa, Ida-Virumaa or Läänemaa. Three wind farms were chosen as case study areas: Paldiski wind farm in Harjumaa, Narva wind farm in Ida-Virumaa and Virtsu wind farm in Läänemaa.

Research results confirm that it is possible to combine contemporary wind energy production in the constantly changing Estonian cultural landscape. Also, contemporary wind energy displays regional pride by majority of respondents. Most people understand that efficiency of wind energy is higher than the disturbing factors. Wind parks can be aesthetically involved in the landscape, as more than half of respondents think this way.

The common practice of how to develop wind parks as touristic attraction have not developed in Estonia yet.

Keywords: wind energy, regional pride, aesthetics of landscape, wind farm tourism, Estonian landscapes

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Eesti Maaülikool Kreutzwaldi 1, Tartu 51014		**Magistritöö lühikokkuvõte**	
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Lõputöö eesmärgiks on teada saada, kas inimesed on kohanud tuulegeneraatoreid või elavad nende lähedal. Samuti, kuidas nad veedavad vaba aega ja kas neile meeldib maastik oma piirkonnas. Eesmärgiks on välja selgitada, kas inimesed on oma piirkonna üle uhked ja kas nad arvavad, et tuulepargid on maastiku esteetiline osa. Oluline on teada, kuidas inimesed suhtuvad tuuleturbiinidesse, mis on ehitatud nende piirkonda. Samuti, kas on vajadus arendada turismi ja sellega seotud rajatisi nende piirkonnas. Magistritöös viiakse läbi küsitlus inimestele, kes elavad Harjumaal, Ida-Virumaal või Läänemaal. Kolm tuuleparki valiti uuritavateks aladeks: Paldiski tuulepark Harjumaal, Narva tuulepark Ida-Virumaal ja Virtsu tuulepark Läänemaal.

Uurimistulemused kinnitavad, et kaasaegset tuuleenergia tootmist on võimalik kombineerida pidevalt muutuvate Eesti maastikega. Samuti, tänapäeva tuuleenergia kuvab piirkondlikku uhkust enamike vastajate arvates. Enamik inimesi saab aru, et tuuleenergia tõhusus on suurem, kui selle häirivad tegurid. Tuuleparke saab esteetiliselt kaasata maastikesse, sest rohkem kui pooled vastanutest arvavad nii. Üldine praktika, kuidas arendada tuuleparke kui turismiatraktsioone, ei ole veel Eestis välja töötatud. See magistritöö on hea alus, et näidata, et inimesed on tegelikult huvitatud tuuleparkide avamisest avalikkusele.

Märksõnad: tuuleenergia, tuulikuturism, eesti maastikud, maastiku esteetika, piirkondlik uhkus

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INTRODUCTION

Nowadays electricity is necessary for humanity. We can no longer imagine life without electric power. Electricity production has several effects on both the environment and on the people that are both negative and positive. In recent decades, mankind has pursued towards renewable energy sources, which have less negative impacts on the environment in the production of electricity than currently widely used fossil fuel.

The use of wind energy has advanced increasingly towards developing direction with science and technical process. More advanced wind parks are created, where increasingly efficient wind turbines, which are able to produce more amount of energy, are set. Numbers of wind farms are already established in Estonia. First wind turbine was put up in 1997 to Hiiumaa, on cape of Tahkuna, which no longer works. In connection with the increase of renewable energy sources, using the wind power is on the rise. In Estonia are at the moment 139 wind turbines with whole capacity of 309.96 megawatts.

There are disadvantages of wind energy, such as intermittence of the wind, several impacts on environment and people, but there are also advantages. Wind energy doesn't need fuel and doesn't produce any waste in operation. Wind energy strives towards sustainable technology and lifestyle and also offers jobs for local people, benefits for land owners, environment and for whole society. How can people make advantages so beneficial that they fill up disadvantages?

This subject was selected because author is interested in wind energy and finding new solutions to make it more attractive for people and give information about modern wind farm tourist centres which are popular in United Kingdom, Germany and Denmark.

The body of the thesis contains five chapters in which two are literature overview and include chapters Landscape and Renewable energies. Other chapters are: Methodology, Results and Discussion. This thesis will be concentrated on people's opinions of landscape in their area and author is trying to find out if people are proud of their region. How people

feel about wind turbines and if new generation wind farms could be an aesthetical part of their region, which is constantly changing Estonian landscape.

There are three research questions which are building up on each other:

Is it possible to combine contemporary wind energy production in the constantly changing Estonian cultural landscape?

Does contemporary wind energy display regional pride by being touristic attraction?

If wind parks can be aesthetically involved in the landscape, how could we use it in Estonia?

1. LANDSCAPE

1.1 How landscape is explained and viewed

The term landscape has no generally accepted definition and it has been used in different ways. (Tomson, 2007) Word landscape is known in Estonia less than century, however, landscapes, as they are, have been known here as long as people have lived on this planet. The word itself is not clearly defined and the accurate definition always depends on the context used. Yet, everyone has perception of what is meant by that. Land surface forms a relief, surfacing, vegetation and water. No doubt that also birds, animals, people and the environment created by them, also belongs to the landscape. (Sinijärv, 2001)

Concept of landscape was originally used in the early 20th century by the geographers of Tartu to characterize and systematize geomorphological features of land. But landscape has found a much wider usage considering its original meaning. In any case, landscape has acquired a firm place in people's everyday speech and it shows that it's not only a scientific or professional term, but a commonly used definition. (Sinijärv, 2001) In the context of the European Landscape Convention, landscape is defined as characteristic area perceived by the human, which has developed by natural and/or anthropogenic factors and interactions. In landscapes there can be distinguished natural and cultural components. (Tomson, 2007) Landscape may be viewed from natural, humanitarian and applied (including the tourism, cultural heritage and school geography) perspective. (Palang et al, 2005)

In recent decades, the concept of landscape has greatly expanded its use and content. Landscape is viewed as an ecological, cultural, economic and socio-spatial phenomenon at the same time. The landscape is our surrounding, where social and economic activity happens, which lays the foundation to feelings, emotions and a framework of perception. Landscape can be defined as the spatial units in which region-specific elements and processes reflect natural and cultural benefits or history in a spiritual way. ? The landscape is generally considered to be four-dimensional: to the three-dimensional space a time

dimension is added. In reality, human sense gives fifth dimension to the landscape. (Arold, 2005) The fifth dimension provides opportunity for endless landscape interpretations. Just as in art, also in scientific models, it's never to do with nature itself, but only landscape abstraction. (Sepp, 2001) Landscape is a term, where integral part of the concept is a person. Wishing to emphasize the different rates of human impact, often primeval, nature, culture, city or artificial landscapes are spoken about. In the classic sense, discussion of the wilderness has almost gone. (Arold, 2005)

1.2 Sharing the landscapes

Traditionally landscapes are divided to natural landscapes and cultural landscapes. On cultural landscapes can be found more or less traces of human activities, on natural landscapes can be found no human activity, only natural complexes. (Tomson 2007) Real authentic, completely untouched by people, natural landscape could almost not be found. The only natural landscapes in Estonia can be bog complexes and subnatural forests. (Sinijärv, 2001) Parts of virginity of nature, where human foot and especially mind do not reach, are not cultural landscapes. (Lang, 2001)

Our human environment was traditionally divided into two parts: the urban and the rural landscape. Cultural landscapes, which come from living in the countryside, are considered more as natural landscapes than something distinct. Due to dividing the environment into two, cultural landscapes evolved in the rural land can be divided to "natural" and "man-made". Natural cultural landscapes have emerged from peoples close personal contact with its surroundings, man-made cultural landscapes from planning land use impersonally. Natural cultural landscape in Estonia can be considered traditional farm landscape, which was prevailing until the Second World War. An excellent example from the opposite approach is kolkhoz land use, which subjected to forced prescriptions. (Sinijärv, 2001) Communistic region previsied the elimination of differences between rural and urban areas which led to destruction of cultural landscapes. The enormous common fields started to rise and individual farms were destructed or compound together with villages. A new type

of settlement was created: kolkhoz and sovkhoz centres with their citified box houses. (Lang, 2001)

The main cultural landscape look is shaped by the land use, in particular, proportion of land use methods, land use units size, shape and location relative to each other. (Tomson, 2007) The landscape combines a number of contact surfaces, which involve time and space, mental and material sphere and many those involved. Landscape cannot be considered, understood or investigated from a single point of view. It is often observed as a whole, which includes both natural environment and effects of human activity. Conserving landscape, people need to decide whether they want to maintain the processes that have shaped the landscape the way it is or restore the original appearance. Although it is possible to reinstate the state of the landscape, it is almost impossible to restore the social-cultural context, where landscape shaping processes and functions worked. Form, function, process and context interweave in the landscape. (Palang et al, 2005)

Cultural landscape is any landscape populated and considered by people. Not only cultured natural environment physically changed by human activities, but also any unaffected landscape around it, as long as the natural landscape would have some sort of relationship with it. Cultural landscape is connected with the creative human mind and ideology on the one hand and with time on the other hand. It can be regarded only as a continuous process, where each stage is based from previous and is basis for the next one. Cultural landscape is primarily spiritual and metaphysical landscape. (Lang, 2001)

1.3 People participation in landscape

Recently, ordinary local people have been included in scientific studies, because public participation in the studies and implementation activities are popular in a social-scientific approach. This is offering end users the opportunity to talk along with the research about research subject, objectives, data collection, analysis and interpretation. Participation is important tool to avoid not understanding landscapes and alienation of them by locals in the future. More and more people are aware that landscapes do not exist merely for researchers and planners, but for local people and tourists to view and wander around.

Combination of approaches can help to predict the development of the landscape and its social and environmental impact. (Palang et al, 2005)

1.4 Landscapes in change

Inseparable part of landscape approach is dynamics. The landscape is constantly changing. On the one hand, landscape subjects to natural changes, on the other hand, the greatest landscape changing power are people. Changes in society cause changes in the economy and this is reflected in land use and population density. Although the new land use often hides traces from the past, it is still possible to read traces of the ancient times from the Estonian landscape, where ruins of fortresses, different village types and even prehistoric fields are preserved. Manors have left important sign to Estonian landscape, by various estimations Estonia has had over 2000 manor houses over several centuries. Today, there have remained approximately 500 of them. And of course, the countless signs of the Soviet collective farms – fresh traces with large land parcels, abandoned and decaying buildings, fallow fields, copse and drainage ditches. (Sinijärv, 2001) People have changed large part of the landscapes by creating different facilities. (Arold, 2005) Centuries of agriculture have created our wooded meadows, rural life have left settlement patterns and road networks. At different times, Estonia has been sometimes more forested, sometimes less. At the beginning of the last century was agricultural use 2/3 of our land. After the Second World War, the rural population has steadily decreased and agricultural land with it. (Palang, 2006) Foreign powers have reigned Estonia for a long time, which means landscape changing important decisions have mostly been non-Estonian. Rulers have always spoken languages which belong to another language family. (Palang *et al.* 2005)

The landscape is perceived as a whole. Human history is a part of constant environment change, manipulation, destruction and its re-establishment in both material and spiritual way. The landscape has to be considered as pattern of historical memory, which consists of visible and invisible traces of thousands of years of human culture. People are not just passive participants who are born in this environment, but active creators of their

surroundings. Landscape studies analyse landscape as a whole, which includes natural environment and human activity. We perceive the landscape, attach meanings and values to it. (Palang, 2006) Until the 20th century, most people lived in the countryside and were closely related to it. Settlements served primarily market and church functions. The land was most important thing for people, because their life directly depended on it. Exploding progress of industry changed that completely. Due to residence in the city, natural environment is becoming people's own renewable resource. According to the need of nature for people living in the city, can be considered that man is a part of nature and vice versa. (Sinijärv, 2001) Rural life and agriculture are the ones that have shaped the current appearance to the Estonian landscape. (Palang, 2006) By now, people have affected all: the original wildlife, climate, relief and vegetation. Mining, human settlements and agriculture have different cycles than naturally developing landscapes. Every landscape has remains from previous development- and usage phrases. (Arold, 2005)

Landscape carries an important part of Europe's natural and cultural heritage. The land is easily affected and vulnerable. Agriculture, forestry, industry and mineral production technology, as well as transport and tourism development accelerate the transformation of landscapes. Landscape has important role in cultural, ecological and social sphere for connecting the public. (Palang, 2006)

We need to know the history to understand today's landscape. Recent political changes in Eastern Europe have shown that the exchange of socio-economic formations generates time boundary. That makes younger people, who don't have memories from previous formations, unable to understand the landscapes of present time. For example, kolkhoz time buildings are still visible in the landscape, but their purpose and meaning is not understandable for younger generation and foreigners. Thus, historical and contemporary context are equally important in landscape studies. Physical changes in the landscape and people's perception changes of landscapes are not so sudden as changes from political decisions. Also local people will take some time to understand the landscape changes. Physical traces and local stories persist even when operating functions which created them, have ended. (Palang et al, 2005)

2. RENEWABLE ENERGIES

2.1. Renewable energy technologies

The main reason for renewable energy growth has been increasing concern about global warming. Range of policies has been used to promote carbon-free technologies. World energy demand almost doubled between years 1971 and 2003 and is expected to increase by another 40% by 2020. (Fox *et al.* 2007) Nineteenth-century steam engine development for factory production and steam navigation changed things and industrial society was born. Ever since, people have been burning coal, gas and oil in ways which pay no attention to the Earth. That approach has become the opposite of renewable and it's time to change priorities. (Lynn, 2012) The world is facing the global climate warming due to fossil fuels such as gas, oil and coal. (Chebak, Martin, 2016) During the last 30 years there has been deviation away from oil and towards natural gas, as its generates lower carbon dioxide emissions than coal or oil when used for heating or electricity. (Fox *et al.* 2007) All sources of energy have some environmental impacts. Renewable energy sources are considered good-natured, even though they have also some harmful aspects. The environmental impact of fossil fuels has gotten worse over time as human population has grown. People are aware of long-term environmental impact which is global warming which is associated with increasing level of greenhouse gases. Most notably it's because of burning of fossil fuels and greenhouse gas levels have been arising over time due to human actions. Apart from the climate change and other environmental issues bound with fossil fuels, there are more reasons why we need to transition away from these energy sources. Most important reason is that the world doesn't have a choice – none of these energy sources are renewable and that means they will gradually be running out. It is believed that the world has a 40 year supply of oil left. Therefore, shifting away from fossil fuels is promoting national and economic well-being. (Ehrlich, 2013) Increasing concerns about global warming and environmental problems due to using fossil fuels have led world

governments to find ways to slow down the increase of carbon dioxide emissions. (Fox *et al.* 2007)

As mentioned above, pursuing a low-carbon energy system is the most important thing that can be taken towards achieving a more sustainable economy and lifestyle. The demand for energy is set to increase due to continuous population and economic growth. The search for a low-carbon energy system has been a big economic and environmental priority for the last forty years. (Jamasb, 2011) It is widely acknowledged that to prevent a catastrophic climate change, renewable energies will play a key role achieving this goal. It is mandatory to recognize the importance of creating renewable energy landscapes that are aesthetically pleasing to watch and socially acceptable for the people. (Apostol et al. 2016) One of the main pillars of the European Union energy strategy of the past ten years has been the focus on the improvement of renewable energy sources. At the beginning of 21st century, the EU directive established compulsory targets for renewable energy. (Nicolini, Tavoni, 2016) This means, that renewable energies are an alternative energy source that allows building a sustainable development. (Chebak, Martin, 2016) We must seriously consider how we use the energy and other natural resources and how our choices may affect our children in the future. (Sioshansi, 2011) For the last few hundred years people have been using up fossil fuels that took 400 million tears to form. Even if those reserves were unlimited, we could not continue to burn them with impunity. (Lynn, 2012)

Energy is considered renewable if it comes from natural resources. Many of these are driven by the sun, wind, ocean waves, biomass, wind and solar energy. Some other types of renewable energy are tides and geothermal power from Earth's interior. There are no easy energy options in the 21st century. (Ehrlich, 2013) All forms of electricity involve compromises in environmental impact, economics and public acceptability. (Lynn, 2012) The concept of sustainability means that energy usage doesn't compromise the need of future generations' need for energy. (Ehrlich, 2013) Renewable energy is energy which is sustainable in the sense of being available in the long term without exhausting Earth's resources or causing environmental damages that cannot be improved by nature itself. I would be unfair to pretend that renewable energy is an easy answer and there are no environmental effects. It is intermittent, unpredictable and diffuse. Although the fuel is free and the waste products are minimal, investment costs are large. There are greater challenges to be faced and overcome as people move towards to renewable energy technologies. (Lynn, 2012)

2.2. Wind energy

The wind energy industry is growing at a remarkable pace. It is one of the most mature renewable energy technologies and still advancing fast. (Lynn, 2012) World wind energy capacity doubled in every three years from 1990 to 2005. It is questionable if any other technology has grown at such spectacular rate. This fast growth has been encouraged by financial support mechanisms and by very rapid technology mature. Energy outputs have improved, due to larger machines and better reliability. Early wind turbines were quite small, but the size has steadily increased. Use of materials have also developed, so using light-weight materials such as carbon fibre-reinforced plastic may raise wind turbines building limit higher. Using these materials can bring further cost and weight savings in the large machines what are now been developed. (Fox *et al*. 2007) Technological improvements have filled a significant expansion in wind power recent decades. Wind now generates about 2% of the world's electricity. In Denmark it is 20% – highest in the world. The five leading nations for installed wind energy are China, the United States, Germany, Spain and India, which together benefit for 82% of the world total wind energy. (Ehrlich, 2013)

Wind is one of the oldest forms of energy applied by people. The earliest applications are wind mills to grind grain and sailing ships. Wind usage for traction goes back more than 5500 years and its agricultural uses can be traced back to the 7th century in the Middle East. Using wind power for producing electricity is more recent and goes back to 19th century, when Charles Brush had 12kW wind turbine in his backyard used for supplying power to his home and laboratory in 1887. Earliest attempt to supply power to a nation's electricity grid happened in 1931 in the former Soviet Union. (Ehrlich, 2013)

The availability of power supply generated from wind energy varies from which generated from fossil fuels. The biggest difference is that the wind power generation depends on the availability of the wind, compared to power plants which are controlled to produce power according to a demand. Wind power is produced according to the available wind. (Cali *et al.* 2007) Wind is clean and "native" source of energy, which use as renewable energy source has moved increasingly towards developing technical and scientific progress. Wind energy is converted solar energy, which occurs due to uneven heating of Earth's surface. The sun sends 1017 W of energy to the surface of the Earth in every hour and about 1-2%

of it will be converted into wind energy. Wind energy is air which is powered into motion by thermal polar power and is catched in windmills – the wind turns the mill wings and moving energy is converted into electricity. The kinetic energy of the wind is available more or less everywhere on the planet, but collection of wind energy is more efficient by the coast and in mountain areas. Wind energy is environmentally attractive for many reasons. It doesn't involve any health damaging air pollution, forests devastating acid rain, climate-destabilizing carbon dioxide emissions or dangerous radioactive pollution. Wind as a primary energy source, is available for free and can be used locally. It doesn't need extensive infrastructure, such as central supply system for electricity, fuel oil or natural gas. (Tõnsau, 2011)

The success of the development of wind energy in Europe can increase more than ten times compared to current level, if appropriate actions are taken to develop it, such as newest wind turbines, which produce more megawatts of power for smaller damages to the environment and people. In addition, changes in environmental policy to introduction to sustainable development are expected by changing the legislation, making new laws or by joining different environmental regulations, where certain limits must be followed (globally or national level to either reduce or increase). Scientific studies confirm that there are no technical, economic or resource bottlenecks in order to ensure that by 2020 the world's electricity produced by the wind is 12%. (Tõnsau, 2011)

2.2.1. Advantages of wind energy

Reduction of carbon emissions is an advantage of renewable technologies, but this benefit is also declared by supporters of nuclear power. Wind energy need no fuel and don't produce no waste in operation. The nuclear industry other hand dispose radioactive waste. Renewable energies have no serious problems of safety or receptivity to terrorist attack, advantages which nuclear power can never claim. There's also difficulty of isolating civil nuclear power from nuclear weapons production. (Lynn, 2012)

Energy production must strive towards sustainable and emission-free technology. Wind turbines generate electricity without use of chemical compounds and therefore lower the

air pollution from using fossil and nuclear fuels. As human beings, we are part of the ecological world and therefore we need to preserve and improve the living conditions of all creatures that are part of our ecosystem. Wind turbines are one of the key components moving towards sustainable lifestyle. Wind power devices have been recognized as one of the most effective and environmentally friendly renewable energy production resources. Almost every part of modern wind turbines can be recycled. Wind farms take up a small part of the ground and the surrounding area can be used as agricultural land. (Tõnsau, 2011)

Wind energy will replace fossil fuels and their high CO2 emissions. Since the wind turbines do not consume fuel and their operational and maintenance costs are low, the cost of wind power is minimal. Therefore, the increase of wind power in electric energy means that more expensive and polluting power generation technologies such as oil, coal and gas will be displaced from the market. (Tõnsau, 2011)

Wind park construction will not load the environment and wind energy has the lowest life cycle emissions compared to other energy production technologies. Wind turbine compensates its construction energy and carbon dioxide within three to six months. Wind energy has many environmental advantages. Compared with traditional power plants, wind energy offers additional environmental benefits – no NO_x emissions; absence of other air pollutants, such as sulfur dioxide (acid rain effect) and particles which have cancer-causing effects and harmful effects on human health. No water is used during the operation and fuel mining for power generation isn't necessary. (Tõnsau, 2011)

Wind turbines do not pollute the air and emit greenhouse gases, as power plants that use fossil fuels do. Wind energy relies on wind renewable energy, which will not run out, as wind is type of solar energy caused by uneven heating of the atmosphere by the sun, rotation of the Earth and irregularity of the Earth surface. Also, wind energy is one of the cheapest forms of renewable energy. During its lifetime a wind generator produces about 80 times more energy than it takes for its production, maintenance and demolition. (Tõnsau, 2011)

Large part of the wind park developments are built such that it is possible to avoid excessive and unacceptable negative impact on both the social and economic environment. Wind energy production can give certain impulse for economically less developed regions to improve overall economic climate and positive image. Evolving with such technological

development can also develop domestic and local competence and open up new economic sectors. Energy production from renewable sources is more labor-intensive than from fossil fuels, thus offering more jobs locally. On-site jobs generated from wind parks establishment will be primarily related to the transport of the wind turbines (both logistics and implementation), wind turbines construction (construction work and materials), wind parks maintenance and management. (Hendrikson & Ko, 2012)

In case of onshore wind turbines, the beneficiaries are land owners, who have signed a lease with wind farm operator or owner. Benefits for land owners also have a positive impact on economy. Wind parks development also brings along other infrastructure development, as access roads to wind turbines for maintenance are required. Also land tax and general economic impact of wind farms, which reaches indirectly the whole society. (Hendrikson & Ko, 2012)

Wind energy developments can bring significant benefits – financial, environmental and social. Internationally, granting benefits to the local community is constant in countries where wind energy development has been longer and it has larger share (Spain, Germany and Denmark). The situation of economic impact of wind energy developments on local communities varies and there are number of various schemes. (Hendrikson & Ko, 2012)

2.2.2. Disadvantages of wind energy

Wind turbines have to compete on price with conventional energy sources. From windiness depends on whether the wind energy price on the site is competitive or not. Although the price of wind power has fallen significantly over the last decade, the technology still requires higher initial investments than fossil fuels. Biggest disadvantage of using wind energy is that wind is intermittent, which means that the wind does not always blow when electricity is needed. Wind cannot be stored and all winds cannot be harnessed to meet the timing of electricity demands. Thus, balancing the fluctuations of the wind power, other energy sources (hydraulic pump stations or fast-start gas generators) are needed. Good areas for wind turbines are often far away from cities where electricity is primarily needed. Also in outskirts the electrical networks are weaker, which do not enable joining of large

wind farms. Although wind parks affect the environment compared to conventional power plants relatively low, they still have environmental impacts which must be taken into account in the planning of wind farms. (Tõnsau, 2011)

The main negative environmental sides are violation of the view, impact on the local wildlife and the birds, noise and the impact on television and radio communication. However, majority of cases these problems can be relieved by careful installation of wind turbines and design. Negative visual impact and impact on birds arising from wind farms is excessively increased because the same or even greater impact has electrical masts and lines. (Tõnsau, 2011) In the next paragraph author will concentrate only on impacts of wind energy on people.

2.3. Impacts of wind energy on people

2.3.1. Visual impact

The construction of wind parks involves changing conventional landscape picture with unusual visual impact of wind turbines. Visual impact is primarily related to the protection of landscape aesthetic value. It is important that the wind turbine do not disturb the eye. Outstanding of the wind turbines depends of the color, the number of masts and construction. (Tõnsau, 2011) Generally, more cylindrical tower (such as high voltage power line poles) is accepted. Big role plays same appearance among the wind turbines in the area. Three-bladed wind turbines leave aesthetically best impression. Also, the color of the wind turbine is an important visual parameter. Wind turbines are made mostly white or light grey, so the light color diffuses in the environment. (Kilki, 2013) Wind turbines can reveal strong reactions when it comes to aesthetics and visual appearance of wind parks. To some people, they are graceful beautiful sculptures and part of renewable energy future; to others, they are eyesores that compromise the natural landscape. It depends whether a community is willing to accept a wind farm in return for cleaner power or not and this should be decided in an open public convention. (Union of Concerned Scientists, 2013) People's assessments of wind turbines in the landscape pollution are individual and they

are evaluated in public opinion analysis. In general, people have positive attitude towards wind energy production, but they don't want wind turbines near their neighbourhood. (Tõnsau, 2011) People like that are also called as NIMBY person, who has attitude towards proposed wind farms that great idea, but not-in-my-backyard, because it's disruptive. (Good, 2005)

2.3.2. Noise impact

One of the main causes of the public opposition is local people concern about noise generated by the wind turbines. (Tõnsau, 2011) Noise from wind generators has been one of the most studied environmental impacts of this renewable technology. Noise can be measured and predicted easily. Wind turbines produce two types of noise: mechanical (from generators) and aerodynamic (from blades). The aerodynamic noise is produced by the rotation of the blades. The noise depends primarily on the construction of the device. Modern wind turbines have been designed to reduce aerodynamic noise to internationally recognized acceptance level. When people live near a wind farm, it must be taken into care to ensure that sound from wind turbines do not exceed a reasonable level in relation to the background sound. Rural areas are quieter than cities, so the background noise is usually lower. However, there are still noisy activities in the rural area - industrial, commercial, agricultural and transportation. Wind farms are located in windy areas, where background noise is higher anyway and it tends to cover the noise produced by the wind turbines. (Wind Energy – The facts, 2009) Wind turbines generated low frequency aerodynamic noise might disturb people and provoke sleep problems such as childhood night terrors, adults awakening from anxiety and vigilance and the need to urinate at night. Also more frequent and severe headaches, whistling or buzzing in the ears, nausea, pressure in the ears, dizziness, motion sickness, irritability, concentration- and memory problems and panic attacks. Noise or vibration fools human body to think that it's moving. Studies have shown that the way the human body registers balance and movement, affects the brain functions. Disturbance is also affected by the income of the wind turbines. On whose estates wind turbines have been put up and who will receive compensation for it, are not bothered by the wind farms. (Kilki, 2013)

2.3.3. Shadows and reflections

Wind turbines as high structures cause shadows with sunny weather. Two types of environmental factors emerging from wind turbines and sunny weather are known – moving shadows and periodical reflections. Moving shadows are caused by the wind turbine construction parts, when wind turbine blades rotate and cross the axle between reference and the sun. (Tõnsau, 2011) It may disturb people in nearby buildings and people travelling on the roads in the mornings and evenings, as shadows are longest at that time (until 4,8 kilometres). Great impact has shadows flickering and the flicker frequency is an important factor in very dangerous diseases such as epilepsy. (Kilki, 2013) Reflections occur when the sun in reflected occasionally from the wind turbine blades and it causes unpleasant glimmer at the observation point. Reflections are caused by the material of the blades. To prevent it, matte surface treatments are used in modern wind energy turbines. (Tõnsau, 2011)

2.3.4. Electromagnetic field radiation impact

Wind farms may affect radio and television signals (primarily the FM broadcast frequency) transfer, as they are located between the transmitter and the receiver and they present a physical barrier to radio waves. But the main problem is blades' rotation, which reflection can change the radio signals. This effect was major problem with old wind turbines when the blades where made of metal. Today, the blades are manufactured from synthetic materials which have low impact on electromagnetic radiation transmission. Only wind turbine power generator and medium-voltage transformer can emit electromagnetic radiation. The generated electromagnetic field is very weak and it spreads very limited scale, being at least 40 to 50 meters off the ground. Therefore, wind turbines have no electromagnetic radiation impact on wildlife and people. (Kilki, 2013)

2.4 Wind energy in Estonia

The first written records of the wind turbines from the territory of Estonia are from island Hiiumaa, reaching back in time to the year 1572. In the end of 18th century, more information about windmills was gathered. By that time, Hiiumaa had approximately 230 of them. Saaremaa in the same period was known to have 383 turbines and their services were used by 3213 farms. In the end of 19th century, Saaremaa had over thousand of them. There are enough reasons to believe that in the end of 19th century, the number of wind turbines in Estonia reached to two to three thousands but their total power output was only 10 megawatts. The 20th century brought the end of using wind energy in large scale and gave the green light for using modern energy sources such as oil and electricity. Only after the first oil crisis, people started seriously thinking about re-using wind energy again. Drastic increase in oil prices at the beginning of 1970s forced the planners to consider the wind energy again. The national contributions in many countries for scientific research and development work in the field of wind energy gave new boost to technological developments of wind energy. Mostly, these efforts were directed at conversing wind energy to electricity energy. (Tõnsau, 2011)

Exploitation of wind power with modern wind power generators started with co-finance of Estonia and Danish Ministries of the Environment. Along with the Biosphere Reserve Hiiumaa center and Danish companies, 150kW model wind station was built up in 1997 to Tahkuna cape. Unsuitable economic conditions didn't let to build another wind turbine until year 2002, when Virtsu wind park started with two 600 kW wind turbines. In 2004, Pakri wind farm was completed with eight 2.3 MW wind turbines. At the end of 2016, 139 wind turbines were in work in Estonia with total capacity of 309.96 MW. Table with all the existing wind farms and capacities can be found in Appendix 1. (Tõnsau, 2011)

Estonian wind climate is characterized by large territorial and temporal variability. On the one hand, it's due to the location in the northwest part of Eastern Europe plain, which climate and wind influences Icelandic low-pressure atmosphere and Eastern Siberia and the Azores high-pressure atmospheres. On the other hand, the territorial differences in the wind climate, coming from Baltic Sea, lake Peipsi and lake Võrtsjärve. (Tõnsau, 2011)

Stronger winds blow in the coastal areas, particularly in western Estonia and on the islands, but also lake Peipsi area. Wind speed is typically measured ten meters off the ground. On

western Estonia islands and on exposed coastal areas reaches annual average wind speed up to 7 m/s, in North-West and in North-Estonia 5-6 m/s. (Figure 1) Due to uneven relief and forests slowing effect, wind speed decreases sharply in the direction of inland. About 20 km wide coastal zone decreases the wind speed nearly 40%. Inland's annual average wind speed is mostly 4-5 m/s. (Tõnsau, 2011)

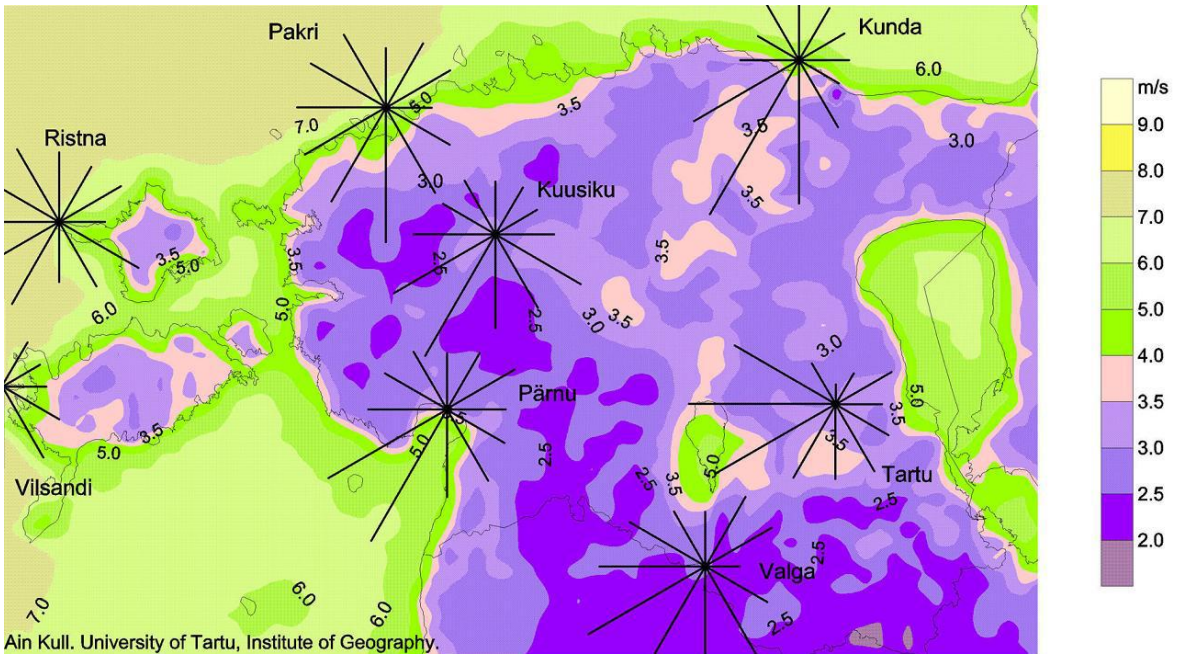


Figure 1. Wind speed 10 meters off the ground (Tuuleatlas, 2012)

Uplands have also impact on wind speed and it varies with seasons. The greatest wind speeds are characteristic to Estonia west coast in the winter, when average wind speed is reaching to 8.5 m/s and strong wind and stormy days are frequent then. In the summer time, wind speeds are smaller and because of that the spatial differences are smaller than absolute values. (Tõnsau, 2011)

Wind energy is usually used in the areas where annual average wind speed is greater than 4 m/s (10 meters off the ground). In the light of economic usefulness, wind energy should be developed in regions where the annual average wind speed is more than 5 m/s. Most Estonian island coastal areas generally exceed the annual average number. Considering birds and vegetation, it has been studied that 7.9 % of Estonian coastal areas are suitable for wind turbines. Estonia islands are one of the windiest regions in Europe; therefore, wind energy production should be economically practical and rational in every way. Every

wind power project developer has a commitment to minimize the negative environmental impacts of wind turbines, considering environmental aspects, health and safety and sustainable development principles. Wind turbine planners must take into account different circumstances, which is why establishing environmentally friendly wind turbine is difficult and time-consuming. (Tõnsau, 2011)

2.5 Social factors of wind energy

2.5.1. Community benefits

Community benefit is monetary or non-monetary benefit what developer contributes to the development of local community where the development affects the environment significantly. Benefits, what local community gets from establishing wind farms, for example:

- Use of local industrial production
- Use of local construction companies and materials
- Holdings sale for local people
- Landowners and NGO-s involvement in the development
- Renting land
- On-site facilities and infrastructure improvements
- Transferring money to local funds
- Financing environmental and habitat improvement projects
- Supporting visitor centres and tourist services
- Hiring local people
- Supporting local schools and education

Looking at different solutions in European Union countries, it appears that a single model for associating wind energy and local community is missing. However, three main lines that characterize different countries can be identified. First, one-time or long-term payment to local funds which is achieved during the negotiations. The solution is typical in British

Isles and in Spain, where local benefit is achievable during negotiations. Second, the local people's financial participation in wind energy projects. It is typical specifically in Nordic countries, especially in Sweden and Denmark, where largest share is local people's investments. Third one is local taxes. For example, Finland and France solve the issue with local taxes. There is no "wind-specific" approach, wind farms are considered as companies in other companies or as buildings-constructions in terms of environmental regulations. (Kokovkin, 2009)

European countries have various measures which compensate the obligation to tolerate wind energy facilities in local communities. Because the properties of Estonian tax system, it doesn't seem possible to use solutions where the local benefit is increased by local taxes (real estate tax, enterprise tax or income tax) as in many countries. Solutions in the Nordic countries are neither realistic, where local people receive income through the ownership of wind farms. In the current situation, should focus particularly on British and Spanish solutions, where community benefit is resolved by negotiations between the developer and the community. (Kokovkin, 2009)

Certain impact on the local community manifests in Estonia already. Beneficiaries of the onshore wind turbines are landowners who have signed lease agreements with wind parks. In addition, with the development of the wind turbines, certain number of temporary and later permanent jobs will involve, which could be filled with local labour force. Worth mentioning are also development of local infrastructure and property tax. Of course, wind parks have the overall economic impact which indirectly reaches to whole society. Fair sharing of wind farms benefits with local community is necessary. However, since the wind farms in Estonia are still relatively rare and wind parks have existed only since 2002, the common practice in Estonia hasn't developed yet. (Karjus, 2011)

Financial instruments practice and opportunities in Estonia:

- National or local taxes/fees for the use of the wind resource/energy produced from wind
- Building/improving local facilities and infrastructure
- Land rent
- Land sale
- Land tax income
- Using the local labour

One practice in Estonia can be considered LLC 4Energia implemented support (0,32 euros per produced MWh) for local NGO-s in Viru-Nigula and Hanila municipalities. (Karjus, 2011)

2.5.2. Aesthetics of wind parks

Severe discussions are taking place across the world at different hearings, public forums and in private policy board rooms, about the aesthetics of wind turbines as features of landscape. Some people are fascinated by the wind turbines, as the hypnotic motion of the blades presents the ecologically-satisfying idea of wind turbines as source of clean and renewable energy. They find wind farms beautiful in deep sense and they think that the perception is connected and shaped by larger ecological context of energy. Others are rejected by their industrial look and even by their presence as a visual intrusion on the natural landscape. They recoil from the sight of the wind farm as an ugly spot on untouched natural land. We'll call the first person an aesthetic wind appreciator, because he sees the beauty of the wind farm and the second, a NIMBY person, who is ecologically-minded individual, but have attitude towards proposed wind farms that great idea, but not-in-my-backyard, because it's ugly. (Good, 2006)

So-called 'NIMBY effect' is common in wind energy debates around the world. One example is Cape Wind's proposal in the US for a 420 megawatt offshore wind farm off the coast of Massachusetts. Opponents of the project were certain that regardless of its environmental impact, it is just too ugly industrial development that would wreck views in a major tourism area and will permanently devastate the unique character of Cape Cod and the island. One NIMBY standpoint is that the wind farm is ugly in an objective sense, because it turns a naturally beautiful landscape, which is not shaped by anthropogenic forms, into a landscape that is ugly and fatally scarred, because of its perceived industrial character, making the location look like an industrial site. (Good, 2006) As aesthetic wind appreciator David Suzuki (Good, 2006) has said:

We see beauty through filters shaped by our values and beliefs. Some people think wind turbines are ugly. I think wind farms are beautiful. They harness the power of the wind to

supply us with heat and light... And if one day I look out from my cabin's porch and see a row of windmills spinning in the distance, I won't curse them. I will praise them. It will mean that we are getting somewhere.

From this aesthetic position, the NIMBY perspective is wrong and hypocritical. If people understand how bad the ecological situation is with our non-renewable energy reserves and how wind energy can play an important role in our transition to sustainable energy society, then people will see the wind farm as beautiful and aesthetical. (Good, 2006)

A communication strategy can be used, where to reach as many people as possible by developing the acceptance of wind power on a local and national level. People can be involved from the start and wind parks can achieve social acceptance among local people and tourists. Determining the visual impacts with public involvement before building a wind farm, can help to lower fears of destruction of the landscape. To reduce negative impacts due to aesthetics of wind farms, they could be built in a way which make them suitable to the landscape and represent a region's landmark. Important is to emphasize positive effects and minimize negative impacts and therefore create regional pride. Good example is Middelgrunden offshore wind farm in Denmark. Good communication is important factor before and during the construction of wind park, since the main problem of their acceptance is lack of information. (Albrecht *et al.* 2013)

2.6. Tourism and wind energy

From environmental impact perspective, the big problem is the noise and visual pollution of wind turbines. Therefore, wind parks must be erected and managed carefully, to do not harm the environment and people around them. There are many examples from the world where impact studies have shown that wind parks are not harmful to the environment and to tourism in the region near wind farms. (Prinsloo, 2015)

One example is Denmark's "Horns Rev" windfarm, which hosts one of the world's largest wind farms and is located in the North Sea. Around 15 km from the wind farm is a beach, where a big concern was about the impacts of wind park structures may have on tourism in

the region. Impact studies around that site fount that the nearby places experienced no decrease in the tourism community levels. The other way around, local economy received a boost by the bigger number of visitors who were attracted to see wind parks. (Prinsloo, 2015)

Likewise, United Kingdom's first wind farm near the sea in "Scroby Sands", response to wind turbines on tourism levels were extremely positive. Educational facilities and information centre were built on the site and in the first six months after opening, around 30 000 visitors were welcomed. This example shows that that renewable energy may actually help tourism industry and may become important tourist attraction in the region. (Prinsloo, 2015)

Similar study was carried out in Scotland in order to determine the general opinion of impact of the local wind farms on tourist decisions. In this study around 55% survey respondents reported positive impressions and only 8% of the opinions were negative. A total of 80% of the respondents stated an interest in visiting an educational centre in the wind farm. It was anticipated that tourists would tend to avoid beached with wind farms in the sea, but 66% of the tourists indicated that they are more likely to visit a beach when wind turbines are in the sea. Social Impact Assessment (SIA) suggests that wind energy facilities may have the potential to attract tourism to the area. (Prinsloo, 2015)

Construction of wind park may involve some negative impact on the tourism, especially visual change of landscape image. The visual landscape change is significant if the wind turbines offer direct view from recreation area or tourism destinations. But even if it opens a direct view, negative impact on the tourist number cannot be automatically assumed. Visitors can decrease as well as increase – usually new type of tourism (wind turbine tourism) will arise which could lead to an increase in the number of visitors. In the majority of holiday makers, wind park will not have significant negative impact on nearby tourism potential. There are people, for whom visiting wind turbines is sightseeing. At local level, wind park developer and tourism businesses could cooperate to reduce the number of potential visitors in the area by developing wind turbine tourism. There are examples where wind turbines have observation platform installed to the top. (Hendrikson & Ko, 2012) In next paragraph are examples from Europe, where wind farms are open to public and used as tourist attraction.

2.6.1. Lillgrund – Sweden

Lillgrund wind farm is located in the Baltic Sea, 11 km from the shore with 48 (each 2.3 MW) wind turbines. Aim of this wind park is to improve acceptance among local people and authorities and make people feel comfortable in renewable energy field. Acceptance of the locals would turn lead to positive impacts on the local tourism industry. Important task was to deal with the fact that local were worried about wind park installation. A communication strategy was set off – the goal was to reach as many people as possible by developing the acceptance of wind power on a local and national level. People were involved from the start – from planning to building the wind park. The Lillgrund example shows the positive outcomes of a proactive and people involving communication and information strategy. (Albrecht *et al.* 2013)

2.6.2. Middelgrunden – Denmark

Middelgrunden wind farm is located in the Baltic Sea, 4.7 km from the shore with 20 (each 2 MW) wind turbines. It is first cooperatively owned offshore wind farm, as 50% of the wind farm is owned by 10 000 private investors. The wind farm is a best example of public involvement, which created local dialogue and acceptance of people. Also unique shape of the wind farm has made Middelgrunden a distinctive landmark of Copenhagen harbor and is even featured on a Danish post stamp. This shows how wind turbines can represent regional pride and how people are proud of it. This wind park also demonstrates that public involvement can lead to a number of advantages and forms a public acceptance. Numerous lectures are held – some in the office of the Cooperative and some on the boat during the trip to the wind farm. Tours take about 1.5 until 2 hours and can be arranged up to 170 persons. For National Turbine Day, guests are given opportunity to visit inside of turbines. Middelgrunden achieved high level of social acceptance and due to public involvement; it has become a true landmark for Denmark. (Albrecht *et al.* 2013)

2.6.3. Scroby Sands – United Kingdom

Scroby Sands wind farm is located in the North Sea, 2.3 km from the shore with 30 (each 2 MW) wind turbines. Wind farm's information center is located on the seafront near the tourist information center and the pier, making it an attractive location for tourists. Entrance is free and wind farm hosts school visits and groups. Scroby Sands is one of the first commercial offshore wind farms in the UK. The exhibition provides general information about renewable energy and wind farms, interactive displays and boat tours. It includes educational area and programme which provides science and geography. Scroby Sands have become local landmark and tourist attraction and people from around the world visit it every year. Nearly every wind farm in the UK has a visitor center, but Scroby Sands is the most popular with 35 000 visitors a year. (Albrecht *et al.* 2013)

2.6.4. The Green Britain centre – United Kingdom

The Green Britain centre is located in Swaffham, Norfolk. The Green Britain Centre is the presenting Green Britain vision. It's a place where the latest technology is put into a vision of a more sustainable lifestyle. Its mission is to inform, educate and empower people - to take the steps towards living in a green world. There is the only wind turbine in the world, which is open to the public to climb. People can take guided windmill tours, spend time at theatre or café, learn about eco-building design and solar panels, walk through organic gardens and go to the top on the wind turbine. Unique displays about renewable energies, transport and food are located all around the area. The Green Britain centre is great example of educational and renewable energy information centre, which is open to public and gives great overview of sustainable lifestyle. (The Green Britain centre, 2017)

2.6.5. Whitelee visitor centre – United Kingdom

Whitelee wind farm visitor centre is located in Eaglesham, Scotland with 215 wind turbines. It is UK's largest onshore wind park. There are more than 130 kilometres of trails to explore by foot, by cycle or by horse. However, there are also bus tours, to get up close to wind turbines on the site. The wind park has interactive exhibitions, hands-on activities and workshops about wind turbines, renewable energy and ecology. Whitelee wind farm is a great place for the whole family to enjoy the great outdoors and get involved in wind energy production. Whitelee is also great touristic attraction as it's been open to public since 2009. (Scottish power, 2017)

These factors can improve the general attractiveness for a region and attraction related to wind energy can open up opportunities for municipalities and cities. Tourist attractions can be information centers, sightseeing, boat tours, viewing platforms on wind turbines and educational workshops and information boards. Good communication strategy and proactive information campaigns are necessary to include public participation into the planning phase as main problem at the moment is lack of information for local people. Diversity is a key factor and beside tourists, other people can be targeted as well – locals, students and children. (Albrecht *et al.* 2013)

3. METHODOLOGY

It was important to give an overview of the changing Estonian landscapes, how they always have been in change people participation in landscape. Also give overview of renewable energies and climate change in connection to fossil fuels. Wind energy and its remarkable growth at sustainable energy field was described. Also advantages and disadvantages of wind energy and wind energy impact on people. Also describe wind energy situation and wind climate in Estonia. How wind farms can be beneficial to local communities and how it could be used in Estonia. Important part was also aesthetics of wind parks and explanation of the 'NIMBY effect'. Overview of connections between wind farms and tourism was given and also introduction of five wind farm tourist centres from abroad.

The aim of the thesis was to find out if people have seen or lived nearby wind turbines. Then, how they spend their free time in their area and do they like the landscape in their region. Aim was also to find out if people are proud of their region and do they consider wind farms as an aesthetical part of the landscape. Important was to find out how people feel about wind turbines, which are built in their region. Also, is there a need for developing tourism and its facilities in their area and could wind turbines be used for it. Two examples of wind farm tourist centres are shown and people respond what they think about these centres and if they could image something like this in their region and if not, then why. It was important to analyse responses by three case study areas individually to find out different outcomes on specific case study regions.

Three wind farms were chosen as case study areas: Paldiski wind farm in Harjumaa, Narva wind farm in Ida-Virumaa and Virtsu wind farm in Läänemaa. These wind farms had most number of wind turbines and biggest overall capacity in Estonia. The questionnaire was directed only to the people from Harjumaa, Ida-Virumaa or Läänemaa. Questionnaire collected statistical data about perceptions and preferences of people in these three case study areas.

The survey had a total of three general questions and 11 core questions. Questions were made in two different types: choice of options or open responses. The form of the questionnaire is added to the appendixes (Appendix 2 and Appendix 3).

The questionnaire was conducted in online form in Google Docs (Google, 2017) and shared in Facebook. Microsoft Excel (Microsoft, 2017) spreadsheet was used for analysing the data. Respondents selection was based on the principle that the respondents would be in different ages, have lived different amount of years in the area and Harju-, Lääne- or Ida-Virumaa residents in order to find out how similar or different average people opinions are on the wind farms. In next three chapters are overviews of three case study areas in Estonia: Narva, Paldiski and Virtsu wind farms.

3.1 Narva wind farm

Narva wind farm is located in Ida-Virumaa, on previous Baltic thermal power plant ash field number two. Area is post-mining landscape, where last ash was pumped out in 1987 and ash field was closed in 2008. Wind farm was finished in 2012 and its height is 40 meters above the sea level. (Verlis, 2012) Land covered by the wind park is 330 hectares big and whole capacity is 39 megawatts. The wind farm has 17 Enercon E82 wind turbines, which are constructed on the posts which extend through ash layer to the depth of 40 meters until the surface of the limestone. (Tuuleenergia, 2012) The ash field has good wind conditions, there is no human settlement and no tall trees grow there. As a result, the ash field is suitable location for a wind farm as legally it is a waste land and wind farm is one of the few options to develop economic activity in this area. (Verlis, 2012) Narva wind park is known to be the world's first wind park built on the ash field. (Tuuleenergia, 2012)

Figure 2. Narva wind farm. (Lust, 2016)

3.2 Paldiski wind farm

Paldiski wind farm is located in Paldiski town, Harjumaa, on part of the former Soviet army coast guard territory and on territory of post-soviet industrial town. The wind park was finished in 2012. The wind farm has 18 2.5 MW capacity wind turbines and the total capacity of the wind farm is 45 megawatts. Land covered by the wind park is 125 hectares big. Total cost of the wind park is 62 million euros. Wind turbines manufacturer is GE Wind Energy in Germany and wind park planned lifetime is 20 years. Special project company Pakri Tuulepargid OÜ has been created for Paldiski wind farm. (4Energia, 2015c) Paldiski is also the first town in Estonia which produces 100% renewable electricity, enough more than the town consumes. (Linkgreim, 2013)

Figure 3. Paldiski wind farm (Süvirand)

3.3 Virtsu wind farm

Virtsu wind farm is located in Virtsu, Hanila Parish, Läänemaa and is shared to three parts: Virtsu I, Virtsu II and Virtsu III. (4Energia, 2015a) Area is illustrated by large abandoned post-agriculture landscapes. (Riigi Teataja, 2004)

Virtsu I wind farm total investment is 1.2 million euros and land covered by the wind park is 6.3 hectares big. Virtsu I wind park was finished in 2002. The first wind turbine of the park was connected to an electric grid in October 2002 and in the same month the wind farm reached its full capacity. The wind farm has two 0.6 MW capacity Enercon E-40 type wind turbines and total capacity of the wind farm is 1.2 megawatts. (4Energia, 2015a) One additional wind turbine was added to the area in 2008, which total capacity is 0.8 megawatts and its developer is Eesti Energia AS. (Tõnsau, 2011)

Virtsu II wind farm was completed in 2008 and the total investment is 7.8 million euros. The first wind turbine was connected to the electric grid in April 2008 and in the same month the wind farm reached its full capacity. Virtsu II wind park has three 2.3 MW capacity Enercon E-70 type wind turbines and the total capacity of the wind farm is 6.9 megawatts. (4Energia, 2015b)

Virtsu III wind farm was built in 2009 and the total investment is 9.8 million euros. The first wind turbine was connected to the electric grid in February 2010 and the wind farm reached its full capacity in March 2010. Virtsu III has three 2.3 MW capacity Enercon E-

70 type wind turbines and the total capacity of the wind farm is 6.9 megawatts. Land covered by Virtsu II and III wind parks is 39 hectares big. (4Energia, 2015b)

Wind turbines manufacturer is German company Enercon GmbH and wind parks planned lifetime is 20 years. Special project company Hanila Tuulepargid OÜ has been created for Virtsu I, II and III wind parks. (4Energia, 2015b)

Figure 4. View from Virtsu III wind farm (Bioneer, 2013)

4. RESULTS

260 people responded to the questionnaire. 21% of them were from Ida-Virumaa, 35% from Läänemaa and 44% from Harjumaa (Figure 5).

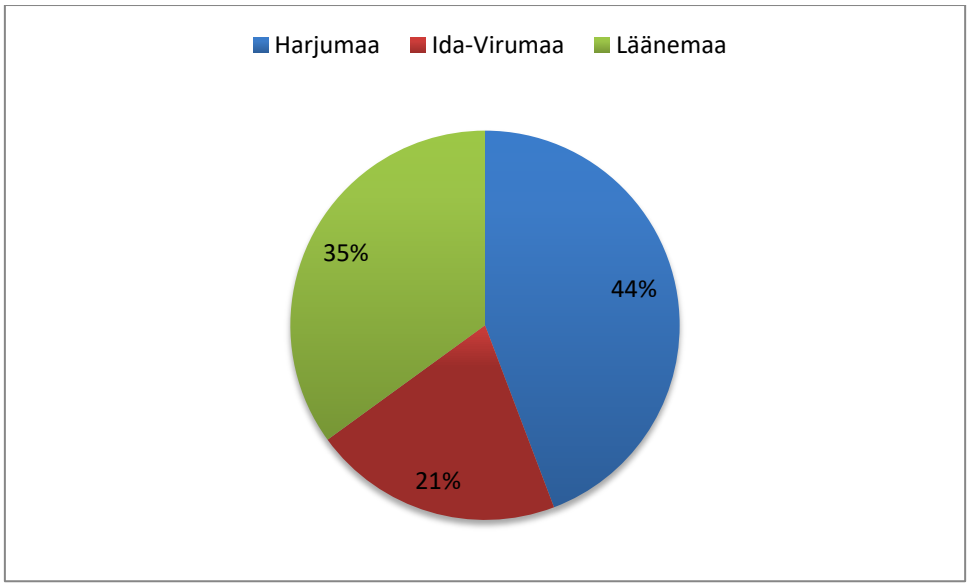


Figure 5. Residence of respondents

The age of the respondents was shared to four groups: 44% were in age 19 until 30, 36% in age 31 until 50, 12% older than 50 and 8% were under 18 years old (Figure 6).

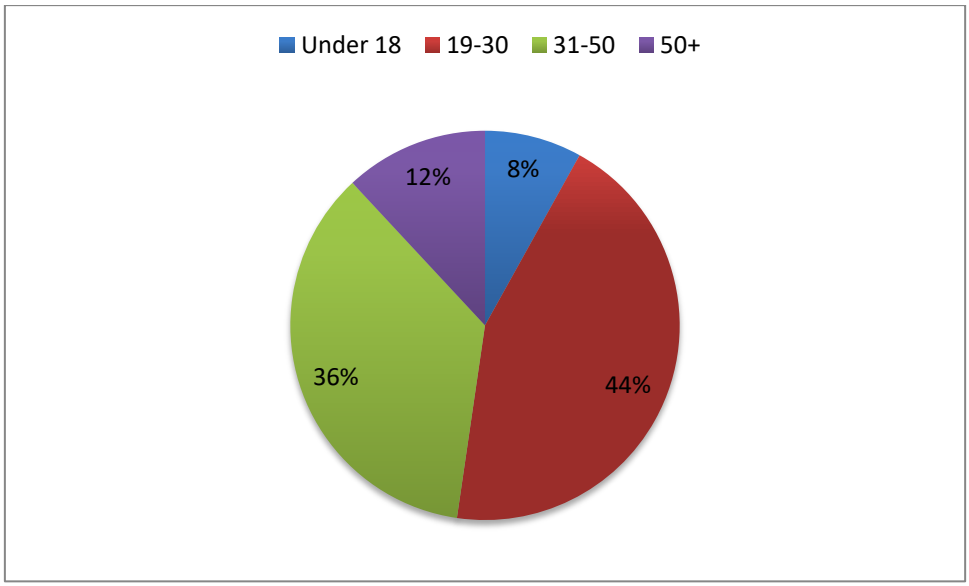


Figure 6. Age of respondents

49% of people who answered the questionnaire had lived 11 until 25 years in the region (Figure 7). 20% of people had lived 26 until 40 years, 21% less than 10 years and 10% of the respondents more than 40 years.

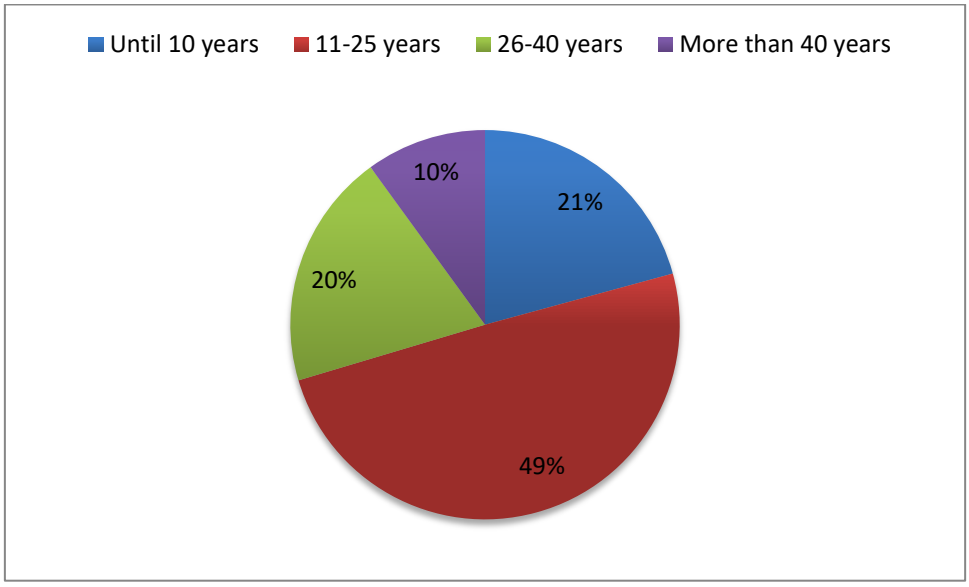


Figure 7. Respondents' years lived in their region

4.1. Narva wind farm

From all respondents 54 people were from Ida-Virumaa. 52% of the respondents were in age 19 until 30 years old. 32% were 31 until 50 years old, 9% were under 18 and 7% older than 50 years old (Figure 8). 51% of the respondents had lived 11 until 25 years in the region; following 23% had lived 26 until 40 years. 18% of people had lived in Ida-Virumaa over 40 years and 7% less than 10 years.

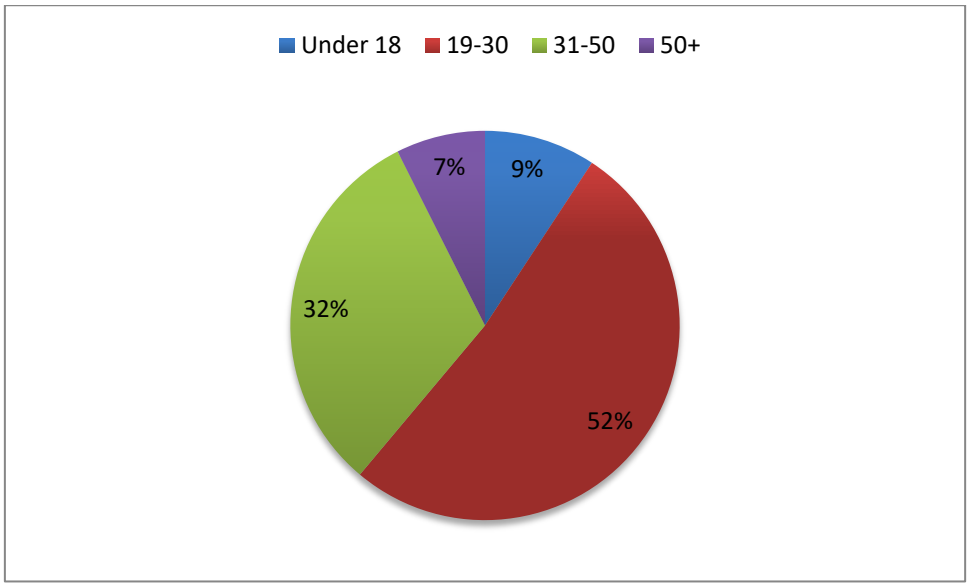


Figure 8. Age of respondents in Ida-Virumaa

4.1.1. Region

People were asked how they spend time in their region besides living there. Most popular answer was farming, as 7 people (13%) chose that answer (Figure 9). Second popular was having a summerhouse in the area, which got 5 answers (10% of respondents). Equally four people (8%) responded camping; sport; camping, summerhouse, farming; camping, sport, fishing; camping, farming and sport, summerhouse. One person also wrote tourism and enjoying nature, besides camping, sport, farming and having a summerhouse in the region. One respondent wrote camping, fishing, sport, summerhouse, farming and also military action. No one from respondents chose only fishing.

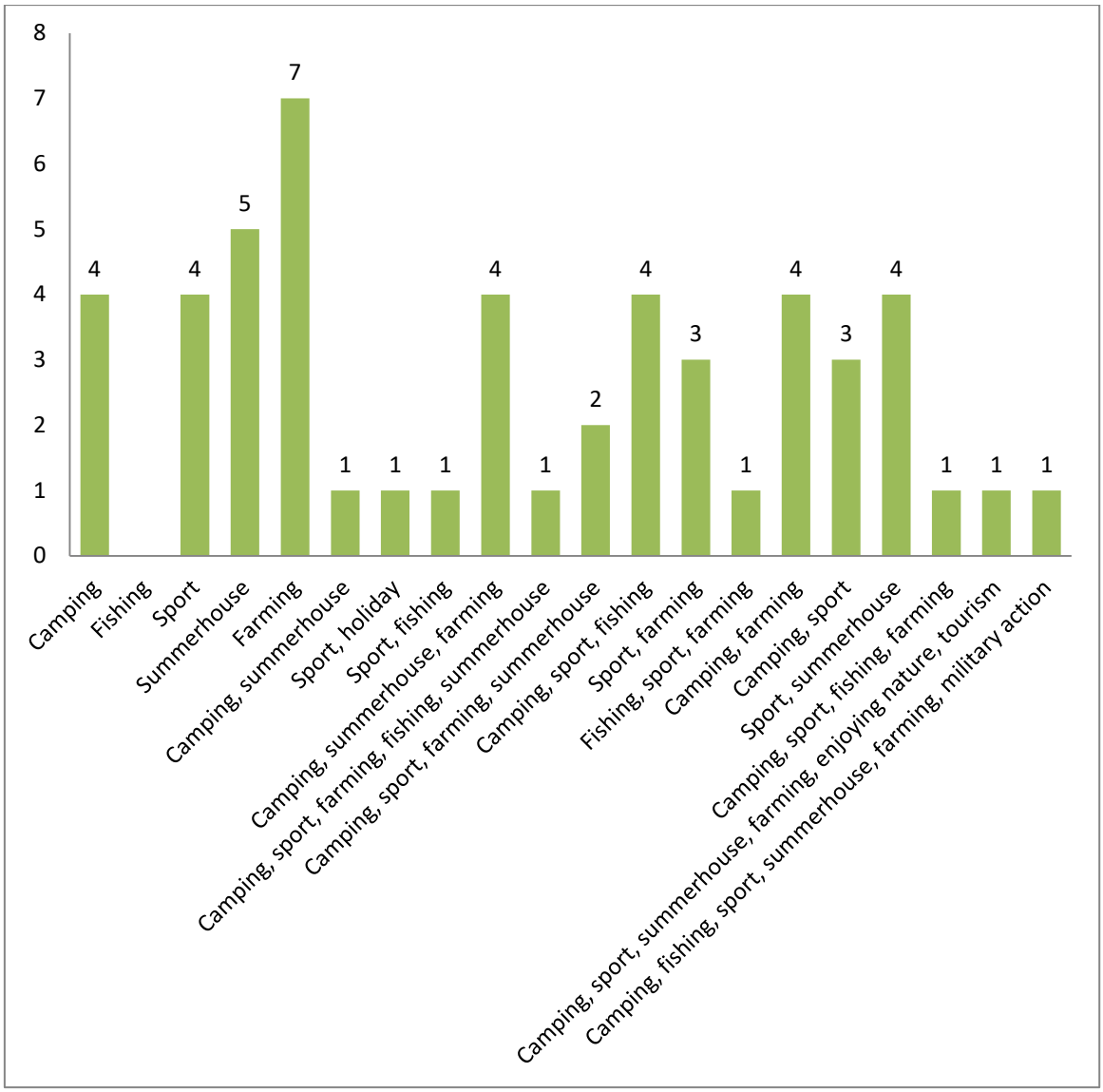


Figure 9. Usage of the region by respondents

Next question was if people like the landscape in the region and if not, then why. 98% of the respondents said they like the landscape. One person answered no and wrote: *Lot of artificial nature – mining waste hills, former quarry areas which have not been restored and land is falling in on previous mining areas, which is dangerous.*

People were asked if they are proud of their region. 83% of the respondents (45 people) are proud and 17% (9 people) are not proud. Eight people of them like the landscape in their region and one of them don't like it. 78% of people who are not proud of their region, have

lived there 11 until 25 years. 22% have lived 26 until 40 years in the region. Seven respondents who said they are not proud, are 19 until 30 years old and two of them under 18 years old.

4.1.2. Wind turbines

76% of respondents from Ida-Virumaa think that wind turbines are an aesthetical part of their region. 24% believes that wind turbines are not an aesthetical part.

To the question if people have come across or live nearby wind turbines 96% of respondents answered that yes, they have. 4% of the people have not come across the wind turbines or don't live nearby them. The two people were in age between 19 and 30.

Next question in connection to wind turbines was how people feel about wind turbines in their region. 37 respondents from Ida-Virumaa replied to that question. 76% of respondents are positive towards wind turbines, 13% are neutral and 11% are negative about them (Figure 10).

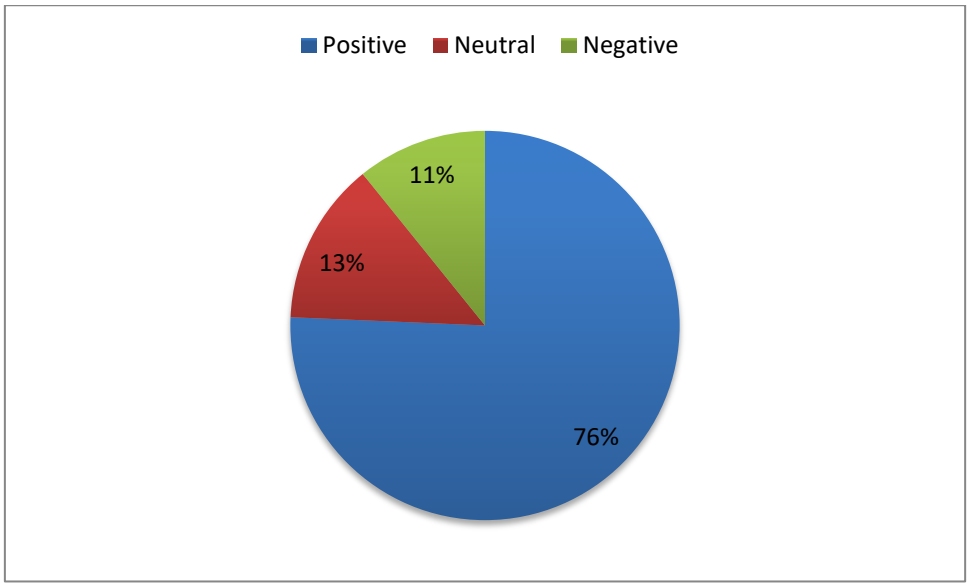


Figure 10. How people feel about wind turbines in their region

Some positive opinions of how people feel about wind turbines:

- *Wind turbines have good aim and that's why I feel positive about them. Pity is that people have not done anything with them, wind turbines are just standing and people don't go there or are not interested in them.*
- *They are little disturbing, but the efficiency is higher. Unfortunately landscape picture cannot remain the same as 100 years ago.*
- *Very well, since we can produce energy without turning the whole nature upside down. In mining areas people don't need to think about land or houses sinking.*
- *They have become kind of landmarks.*
- *Wind turbines don't bother me, they are rather tourist attractions – big and proud.*

Respondents also have some strong opinions why they feel negative about wind turbines:

- *Wind turbines should be placed as far as possible from houses and farms; otherwise they disturb the everyday life. They are not the most beautiful and cause unpleasant noise.*
- *Visual pollution.*
- *Actively are working only few wind turbines, the full potential should be used, rather than wasting the resource on non-working generators.*
- *Negative, as there are too much of them and only half of them works at the same time.*

4.1.3. Tourism

First question about tourism was if there is a need for developing tourism and its facilities in respondents region. 91% of the respondents believe that there is need for it and 9% responded that it is not necessary.

In next question, two examples from Great Britain's wind farm tourist centres were shown. After seeing pictures of the areas and reading information about them, respondents were asked what they think about these wind parks which are open to the public. 41 respondents

answered to that question. 90% of respondents feel positive about wind farm tourist centres, 7% feel negative and 3% are neutral, don't think anything (Figure 11).

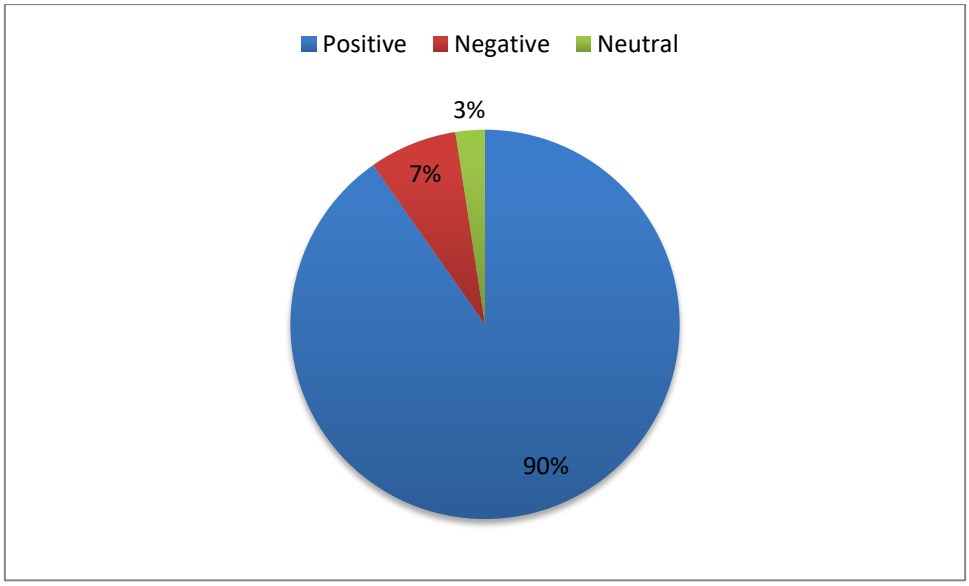


Figure 11. How people feel about wind farm tourist centres

Positive responses were:

- *Interesting, positive. People understand wind turbines work and usefulness.*
- *Certainly with access to them. There is enough industrial landscape in my region to establish it.*
- *I like these ideas. We could use them in Estonia and teach people about renewable energies and local culture.*
- *Positive, if they are located in areas where they don't disturb local people. Also depends on the context of the exhibition: whether it's one-sided praise for wind parks or impacts and dangers on people are honestly spoken about.*
- *Could be used to attract people to the region.*
- *Great idea how to take advantage of something functional and bring tourism to the region.*

Negative opinions were three:

- *For me, it's irrelevant.*
- *Nothing to watch.*
- *Don't see it as touristic attraction.*

People were asked if they could imagine wind farm tourist/information centres in their region and if not, then why. 85% of respondents could see wind farms open to public. 15% of respondents couldn't image them in their region and four respondents answered why:

- *Doesn't fit into this cultural space.*
- *Unpleasant sound and frightfully big structures.*
- *Our region doesn't contribute to such matters.*
- *Our region touristic attractions are Estonian longest sand beach, the sea, pine forests, Narva river and limestone cliffs. Industrial sites that are compressed to small area are starting to cross the line of tolerance among local people. In the current situation, each additional wind turbine it simply a sign of disrespect towards local people. Only owners get profit growth through system of electrical taxation.*

4.2 Paldiski wind farm

From all respondents 115 people were from Harjumaa. 51% of the respondents were in age 19 until 30 years old. 31% were 31 until 50 years old, 11% were older than 50 and 7% were under 18 (Figure 12). 48% of the respondents had lived 11 until 25 years in the region; following 34% had lived under ten years. 14% of people had lived in Harjumaa 26 to 40 years and 4% more than 40 years.

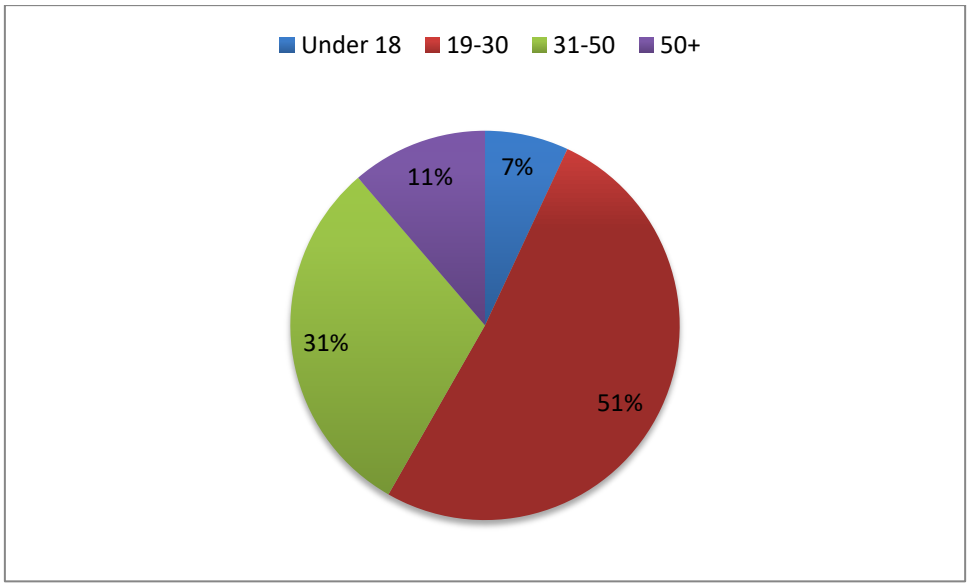


Figure 12. Age of respondents in Harjumaa.

4.2.1. Region

People were asked how they spend time in their region besides living there. Most popular answer was camping and sport, as 32 people (30%) chose that answer (Figure 13). Second popular was sport, which got 23 answers (21% of the respondents). 14 people (13%) responded camping. Equally 4 people (4%) answered camping, sport, summerhouse and summerhouse. One person also wrote community work and three of respondents wrote resting. None of the respondents chose only fishing or only farming.

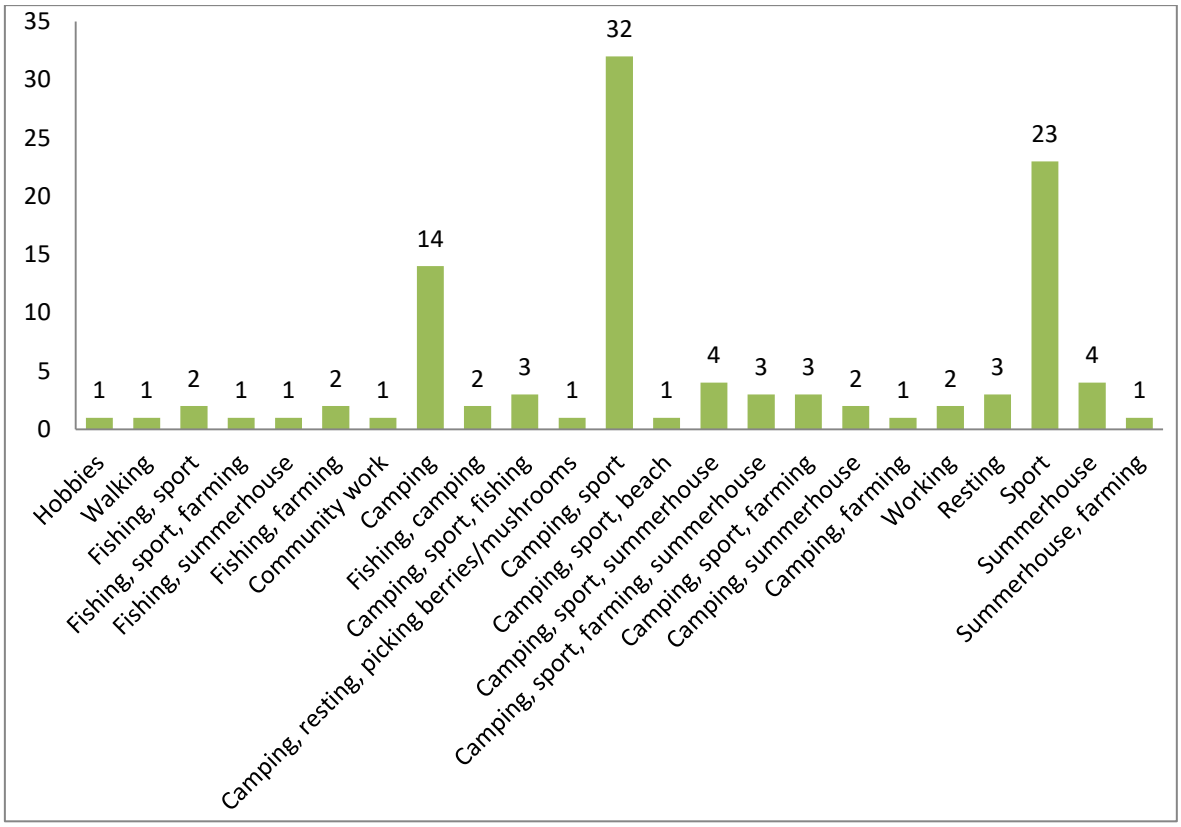


Figure 13. Usage of the region by respondents

Next question was if people like the landscape in the region and if not, then why. 96% of the respondents wrote they like the landscape. 5 people (4%) responded they don't like it and wrote why:

- *Too much artificial landscape, which is interfering with natural landscape.*
- *It is rather drab.*
- *No, because I live in a town.*
- *Not enough greenery and pedestrians have dangerous and unfavourable conditions.*

People were asked if they are proud of their region. 77% of the respondents (89 people) are proud and 23% (26 people) are not proud. 15% of the people, who are not proud of their region, don't like the landscape in their region too. 85% of the respondents, who are not proud of their region, like the landscape in their region. From 26 people, who are not proud of their region, 69% of them are in age 13-30, 15% in age 31-50, 8% older than 50 and 8% younger than 18 years old.

4.2.2. Wind turbines

54% of respondents from Harjumaa think that wind turbines are an aesthetical part of their region. 46% believes that wind turbines are not an aesthetical part.

To the question if people have come across or live nearby wind turbines 78% of respondents answered that yes, they have. 22% of the people have not come across the wind turbines or don't live nearby them. 20 people who answered no, were in age between 19 and 30, 4 people in age 31-50 and 1 person was older than 50.

Next question in connection to wind turbines was how people feel about wind turbines in their region. 82 respondents from Harjumaa replied to that question. 55% of respondents are positive towards wind turbines, 16% are neutral and 13% feel negative about them (Figure 14). 10% of people responded that there is none in their region and 6% are NIMBY (Not-in-my-backyard) people. NIMBY effect means people have positive attitude towards wind energy, but they don't want wind turbines near their neighbourhood (page 20).

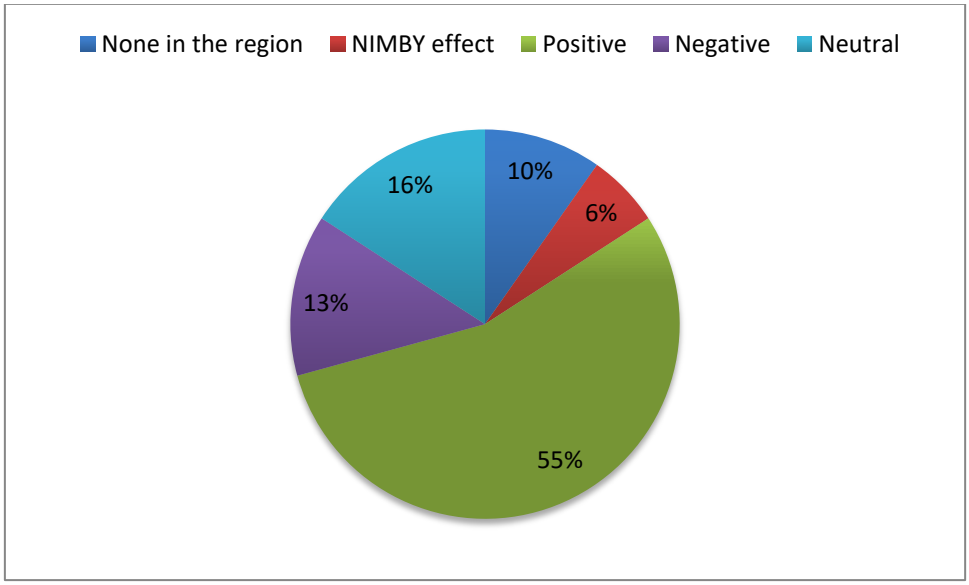


Figure 14. How people feel about wind turbines in their region

Some positive opinions of how people feel about wind turbines in Harjumaa:

- *Wind turbines don't disturb me, knowing they are part of green energy production. Somewhere in Estonia they have to be and they are still not allowed in sea.*
- *I think they create an interesting part to the city's image and are environmental friendly.*
- *Wind turbines add modernity and promote greener energy usage, which is not bad.*
- *Wind power is efficient, environmental friendly and using renewable energy resources is justified.*
- *I am proud that my region produces green electricity to Estonia.*
- *I relate to wind turbines rather good, as they are attraction to some people and thanks to that also tourism develops.*

11 people, who feel negative about wind turbines, mostly wrote "*Bad"* or "*Negative"*. Some people responded:

- *Wind turbines could actually be real benefit to Paldiski town too.*
- *They don't disturb me, but building of wind turbines violated and distorted the natural environment and there are no benefits to the region.*
- *Wind turbines don't directly disturb the eye, but they don't fit to the landscape – large empty field filled with generators. My opinion may also be related to the fact that as an ordinary electricity user I don't see their efficiency.*

4.2.3. Tourism

First question about tourism was if there is a need for developing tourism and its facilities in respondents region. 75% of the respondents believe that there is need for it and 25% responded that it is not necessary

In next question, two examples from Great Britain's wind farm tourist centres were shown. After seeing pictures of the areas and reading information about them, respondents were asked what they think about these wind parks which are open to the public. 84 respondents

answered to that question. 83% of respondents feel positive about wind farm tourist centres, 11% feel negative and 4% are neutral (Figure 15). 2% of respondents like the idea, but don't want it developed near their region (NIMBY effect).

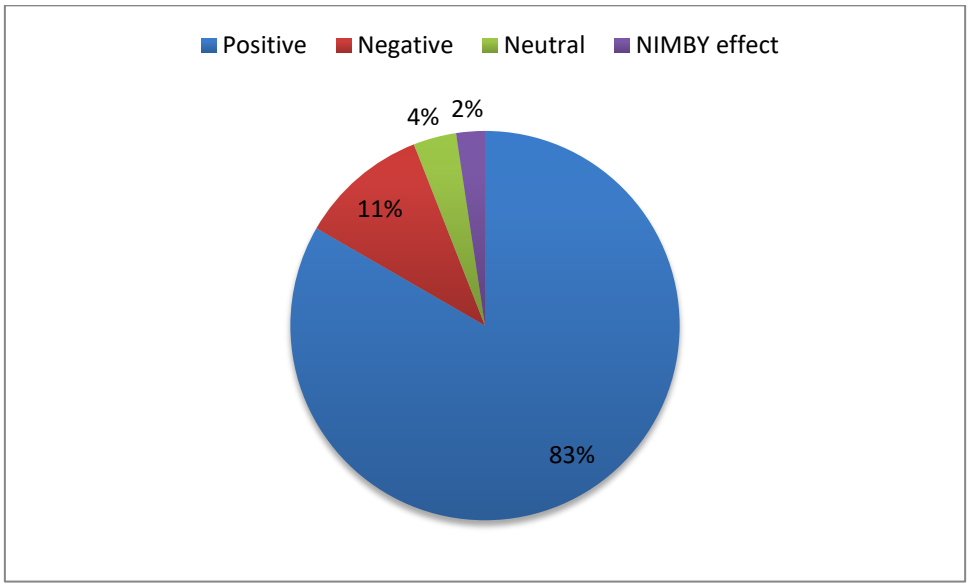


Figure 15. How people feel about wind farm tourist centres in Harjumaa

Some positive responses were:

- *I think they are good and necessary to show society why wind farms are needed.*
- *Good idea.*
- *Very positive business, extends tourism opportunities.*
- *Good idea, educational and promoting eco-tourism, in return supporting the local economy. Good assumptions for becoming a tourist attraction, but also location's capacity should be evaluated.*
- *Cool! Estonia could do that!*
- *Reasonable way to promote wind energy.*
- *Positive, we could also have something like this. People already visit the wind turbines, visitor centre would be a perfect tourist destination!*
- *Very positive. Gives people an overview and introduces the importance of wind farms. This is good prevention work.*

Negative responses:

- *I don't understand why wind farm should be a visitor centre.*
- *I wouldn't visit this object.*
- *Unpleasant.*
- *They are boring and pointless.*
- *Wind turbines disturb birds' life.*
- *View from the top is great, but I don't see wind turbines as a touristic attraction.*

People were asked if they could imagine wind farm tourist/information centres in their region and if not, then why. 77% of respondents could see wind farms open to public. 23% of respondents couldn't image them in their region and 20 respondents answered why.

Some answers:

- *Perhaps the scale is too big for Estonia.*
- *I don't want this near my home, perhaps in Ida-Virumaa degraded area, it would be interesting. Renewable energies are good, but developers also need to consider animals, birds and insects.*
- *Too much noise from wind turbines.*
- *Issue of noise, also increasing transportation load on the roads*
- *It is pointless.*
- *Paldiski town government don't think about tourism attractions!*
- *Wind turbines are not touristic attraction.*
- *Wind turbines are not part of tourism, they are part of industry.*

4.3 Virtsu wind farm

From all respondents 91 people were from Läänemaa. 45% of the respondents were in age 31 until 50 years old. 31% were 19 until 30 years old, 15% were older than 50 and 9% younger than 18 years old (Figure 16). 52% of the respondents had lived 11 until 25 years

in the region; following 24% had lived 26 until 40 years. Equally 12% on people had lived in Läänemaa over 40 years and less than 10 years.

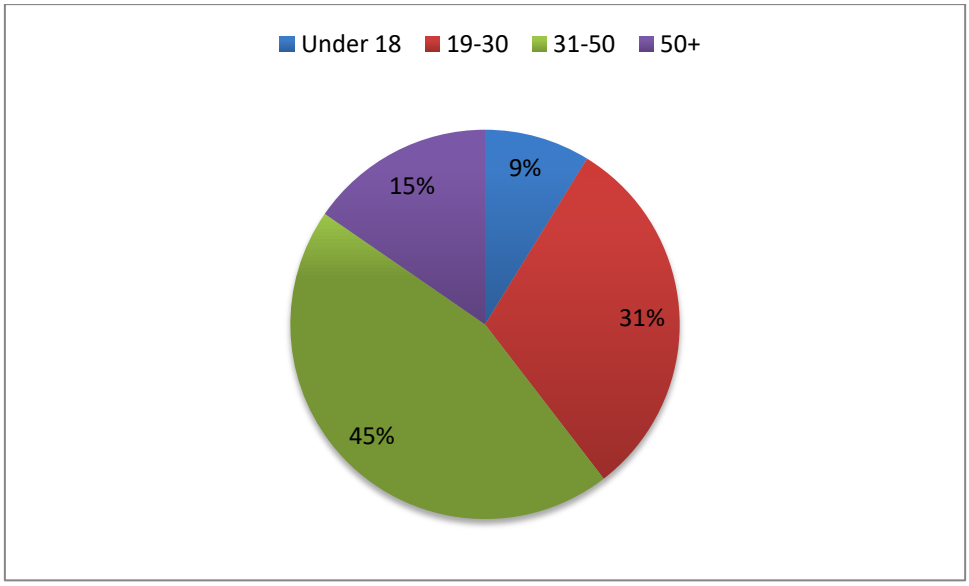


Figure 16. Age of respondents in Läänemaa

4.3.1. Region

People were asked how they spend time in their region besides living there. Most popular answer was camping and sport, as 11 people (12%) responded that (Figure 17). Second popular was farming, which got nine answers (10% of respondents). Equally eight people (9%) responded camping, sport, farming and camping, sport, fishing. Seven people (8%) wrote they spend time doing sports and six people (7%) responded camping. One person responded also bee-keeping, besides fishing, sport and farming. One respondent wrote art and creative activity and gardening.

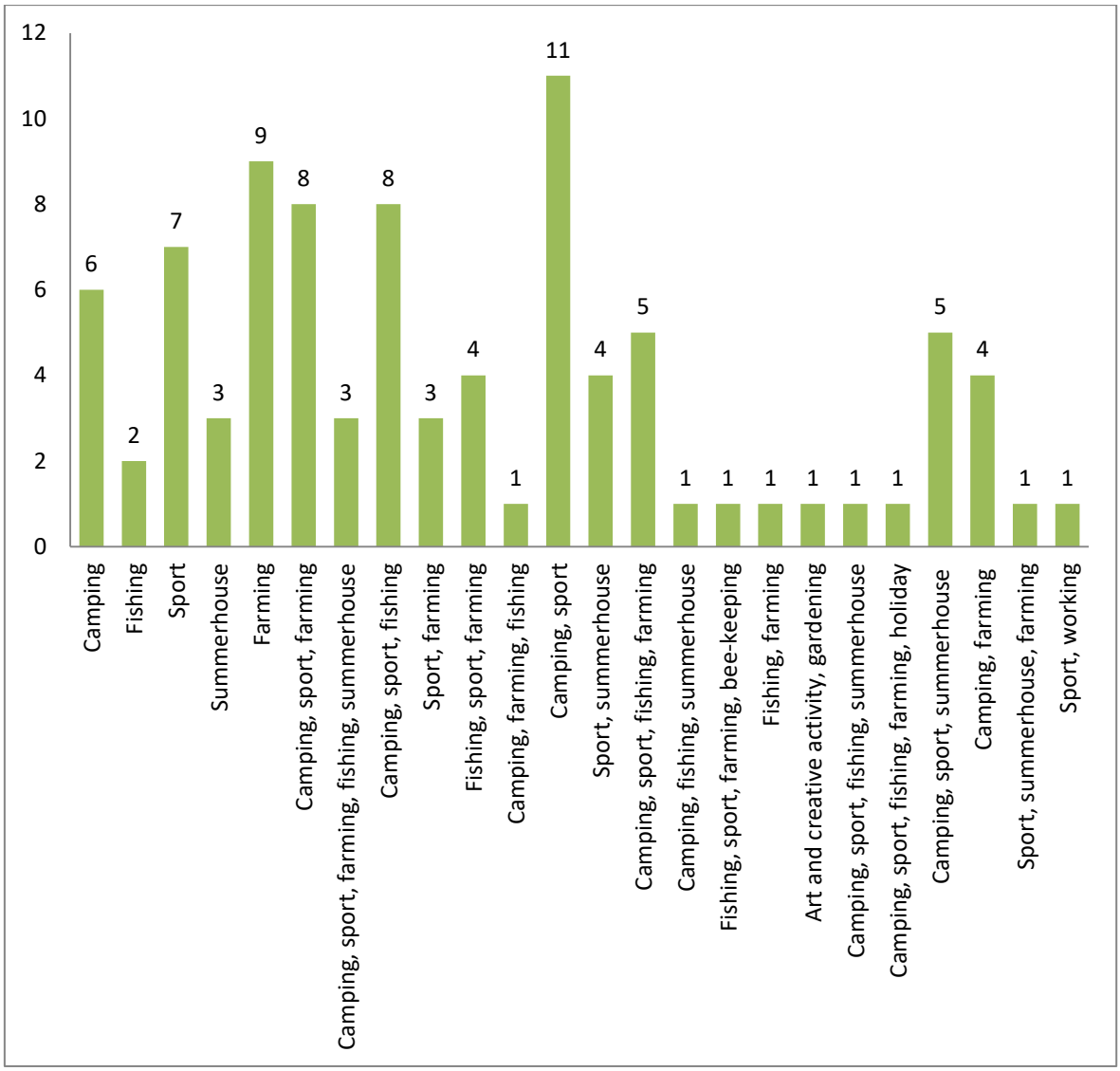


Figure 17. Usage of the region by respondents

Next question was if people like the landscape in the region and if not, then why. 97% of the respondents said they like the landscape. Three people answered no and wrote:

- *Too flat, I miss the mountains.*
- *I liked the landscape until they built the wind park. Near our home is beautiful meadow, but near are wind turbines.*
- *Wet, lot of reed and clay, mossy and flat.*

People were asked if they are proud of their region. 95% of the respondents (86 people) are proud and 5% (5 people) are not proud. All respondents who are not proud of their region

like the landscape in their region. 80% of them have lived 11 until 25 years in the area and 20% less than ten years. Two people are in age 19 until 30 and three of them in age 31 until 50.

4.3.2. Wind turbines

54% of respondents from Läänemaa think that wind turbines are an aesthetical part of their region. 46% believes that wind turbines are not an aesthetical part.

To the question if people have come across or live nearby wind turbines 79% of respondents answered that yes, they have. 21% of the people have not come across the wind turbines or don't live nearby them.

Next question in connection to wind turbines was how people feel about wind turbines in their region. 59 respondents from Läänemaa replied to that question. 36% of respondents are positive towards wind turbines, 15% are neutral and 19% feel negative about them (Figure 18). 10% of people responded that there is none in their region and 20% are NIMBY (Not-in-my-backyard) people. This means they approve wind energy, but they are happy that wind turbines aren't near their region.

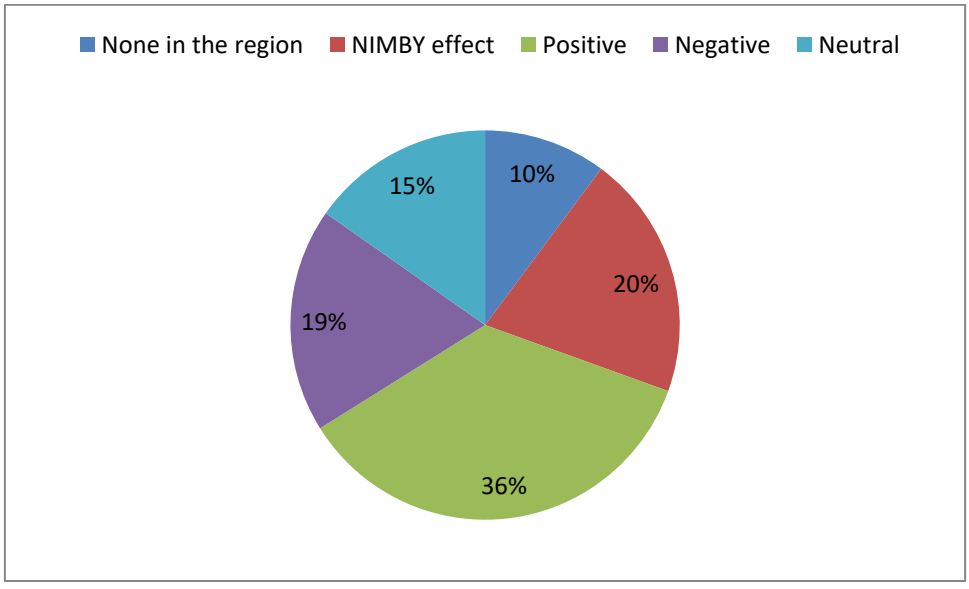


Figure 18. How people feel about wind turbines in their region

Positive opinions of how people feel about wind turbines:

- *Economically useful for local governments.*
- *Let the wind turbines exist, at least better source of energy than from Ida-Virumaa.*
- *Very cool to watch them.*
- *Generally positive. As there are people in family who are in this field, I understand their benefits and need in today's society.*
- *Good as touristic attraction.*
- *Good, wind turbines are beautiful.*

Negative responses on wind turbines:

- *Big and massive.*
- *I don't like them.*
- *Don't like, as they make too much noise.*
- *Wind turbines disturb local people.*
- *I don't think anything good about them.*
- *Wind turbines distract visual view.*

4.3.3. Tourism

First question about tourism is if there is a need for developing tourism and its facilities in respondents region. 85% of the respondents believe that there is need for it and 15% responded that it is not necessary.

In next question, two examples from Great Britain's wind farm tourist centres were shown. After seeing pictures of the areas and reading information about them, respondents were asked what they think about these wind parks which are open to the public. 59 respondents answered to that question. 75% of respondents feel positive about wind farm tourist centres, 10% feel negative and 10% are neutral, don't think anything (Figure 19).

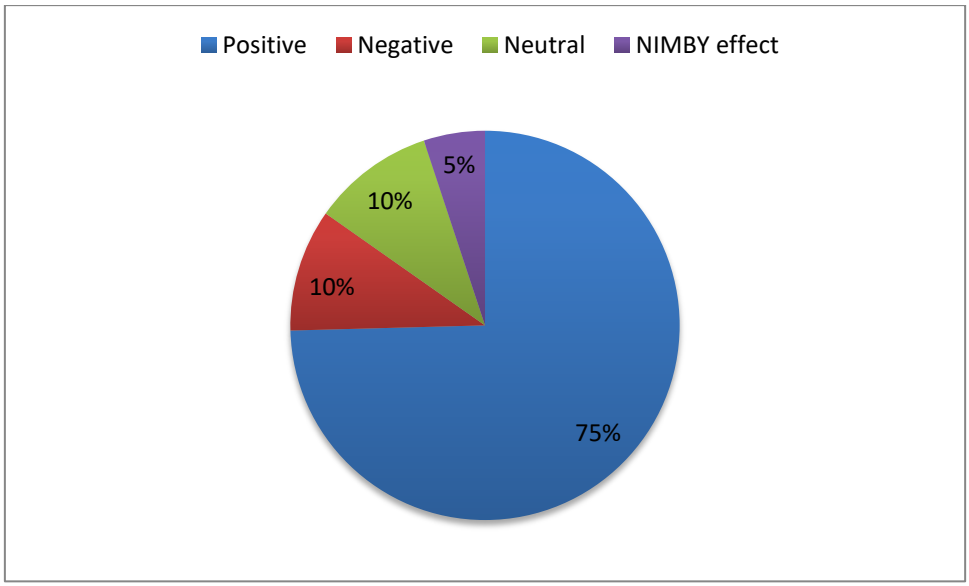


Figure 19. How people feel about wind farm tourist centres

Positive responses towards wind farm tourist centres:

- *I think these open wind parks could also exist in Estonia, would be interesting to acquire knowledge.*
- *Interesting sight.*
- *Useful and informative.*
- *I would visit if there would be opportunity.*
- *Pretty good idea.*
- *Interesting and exciting to watch.*
- *Fascinating attraction.*
- *Nice to see that ordinary people can access wind turbines to understand their size.*
- *It will certainly give positive emotions about wind farms.*
- *Nice, people can be aware of their usefulness and perhaps more sympathetic attitude.*

Negative opinions:

- *I don't feel good about wind turbines as they make too much noise.*
- *Reminds industrial site rather than natural landscape.*
- *As foreign bodies in the nature.*

- *Land could be used in better ways.*
- *Rather don't like it.*

People were asked if they could imagine wind farm tourist/information centres in their region and if not, then why. 79% of respondents could see wind farms open to public. 21% of respondents couldn't image them in their region and 23 respondents answered why. Some of the reasons:

- *Wind turbines don't have tourism value.*
- *Not suitable.*
- *I don't see tourism in them. Rather, wind turbine is a device that produces electricity in environmental friendly way. In my region there are number of people who have installed wind generators in their garden to save money from electricity use.*
- *Not necessary for us.*
- *We have Läänemaa characteristic nature what would be nicer to observe.*
- *We have valuable milieu and peaceful area.*
- *Wind turbines are not tourist attractions.*
- *Unlikely that someone would come to watch them here.*
- *Big and massive.*

5. DISCUSSION

Studying the literature in connection with the thesis subject helped to get fundamental knowledge about Estonian landscapes and their change, overview of wind energy production and it's fast pace in today's world. Also studying the advantages and disadvantages of wind energy, impacts on people and connections between tourism and wind turbines. Reading about different studies and examples from other countries is a good method to understand the subject and think about ways how to open wind farms to public in Estonia. Getting acknowledge of community benefits to local communities in wind farms outside of Estonia and understanding aesthetics of wind parks.

The questionnaire got 260 responses, where 115 people were from Harjumaa, 91 people from Läänemaa and 54 people from Ida-Virumaa.

One aim of the thesis was to find out if people have seen or lived nearby wind turbines. It came out that 214 people have seen wind turbines or lived nearby them and 46 people haven't.

Respondents were asked how they spend their free time in their area and do they like the landscape in their region. Most popular answers were camping, sport and farming. People also responded other answers, such as military action in Ida-Virumaa, having a holiday in Harjumaa and art and creative activity in Läänemaa. 251 like the landscape in their region and only 9 people admitted that they don't like it. Five respondents who don't like the landscape were from Harjumaa and said that the landscape is rather drab and artificial and there's not enough greenery. Three of respondents were from Läänemaa and said that the landscape is too flat, mossy and wet and wind turbines have ruined the beautiful meadow. People from Ida-Virumaa like the landscape most from the respondents, but also there were least people responding compared to other regions.

Aim was also to find out if people are proud of their region and do they consider wind farms as an aesthetical part of the landscape. 220 respondents are proud of their region and only 40 people are not proud. Most proud people are from Läänemaa, as 95% of people

responded yes, next is Ida-Virumaa with 83% and last one is Harjumaa with 77% of the people are proud. This research shows that even though people always don't say that they are proud of where they're from, they actually think like it and admit it anonymously. 152 people think that wind turbines are an aesthetical part of the landscape and 108 people don't agree. Most people, who think that wind turbines are an aesthetical part of their region, are from Ida-Virumaa (76% of respondents). People from Ida-Virumaa find that wind energy is sustainable future and necessary for green energy.

Important was to find out how people feel about wind turbines, which are built in their region. Most positive feedback came from Ida-Virumaa, as 76% of respondent are positive towards wind turbines and no 'NIMBY-effect' was found. 55% of people from Harjumaa are positive towards wind turbines and 6% of respondents feel good about them, but don't want the wind turbines near their neighbourhood (NIMBY effect). Only 36% of respondents from Läänemaa feel positive and 20% of people are Not-in-my-backyard people. People from Läänemaa feel that they have clean nature and national parks and meadows and wind farms ruin the visual picture. Great amount of people like the wind turbines, but not near them.

To the question if there is a need for developing tourism and its facilities in respondents' area, 212 people answered yes and 48 people that there is no need for it in their region. Biggest need is in Ida-Virumaa, where 91% of people answered yes. Next is Läänemaa with 85% of the respondents and Harjumaa with 75%. Respondents were shown two examples of wind farm tourist centres and people responded what they think about these centres. People are mostly positive towards wind farm tourist centres and see them as something new, educational and interesting. 90% of people from Ida-Virumaa, 83% from Harjumaa and 75% from Läänemaa feel positive. To the question if they could image something like this in their region, 85% of the respondents from Ida-Virumaa could see it happening. Mostly positive opinions are also in Läänemaa with 79% and Harjumaa with 77%.

From the thesis came out that it is possible to combine contemporary wind energy production in the constantly changing Estonian cultural landscape, because Estonian landscape have always been in change and formations generate time boundary and younger generation don't even understand the landscapes in present time. People are part of the change what is happening, that is why people need to be connected to the landscape studies

and analysis, because participation is important part for informing and avoiding not understanding.

Also second research question came out true, as contemporary wind energy displays regional pride by majority of respondents, as 220 people are proud of their region and majority of respondents feel positive about wind turbines being a touristic attraction and by that getting benefits for land owners, government and for local people. Most people understand that efficiency of wind energy is higher than the disturbing factors. Also there are share of people, who don't think anything and don't care about wind turbines standing in their region.

Wind parks can be aesthetically involved in the landscape, as more than half of respondents think this way. Wind parks must be built and managed carefully and people need to be involved from the beginning as this is the only way how people will understand and accept the wind farms. Acceptance of the people will give more advantages than disadvantages. The common practice of how to develop wind parks in such way that environment will get least damage and local communities most of the benefits, have not developed in Estonia yet. This research is a good basis to show that people are actually interested in opening wind parks to the public.

From looking at all the results, people are proud of their region. Wind farms in their area can add another element to it. Different examples from United Kingdom and Denmark show that wind energy can be an important tourist attraction and even though there are always negative opinions, the research shows that positive outweighs the negative in wind energy topic.

CONCLUSION

Nowadays electricity is necessary for humanity. The use of wind energy has advanced increasingly towards developing direction with science and technical process. There are disadvantages of wind energy, but there are also advantages.

The aim of the thesis is to find out if people have seen or lived nearby wind turbines. Also, how they spend their free time in their area and do they like the landscape in their region. Aim is to find out if people are proud of their region and do they consider wind farms as an aesthetical part of the landscape. Important is to find out how people feel about wind turbines which are built in their region. Also, is there a need for developing tourism and its facilities in their area. Two examples of wind farm tourist centres are shown and people respond what they think and if they could image something like this in their region. Questionnaire collects statistical data about people's perceptions and opinions. The master thesis results are divided to three parts, by the case study areas: Paldiski wind farm in Harjumaa, Virtsu wind farm in Läänemaa and Narva wind farm in Ida-Virumaa.

The literature research of the thesis is giving an overview of the changing Estonian landscapes, renewable energies and climate change in connection to fossil fuels. Wind energy, advantages and disadvantages of wind energy and wind energy impacts on people are also described. Literature research is also giving overview of wind energy situation and wind climate in Estonia. How wind farms can be beneficial to local communities and how it could be used in Estonia. Important part is also aesthetics of wind parks and overview of connections between wind farms and tourism.

Research results confirm that it is possible to combine contemporary wind energy production in the constantly changing Estonian cultural landscape. Also, contemporary wind energy displays regional pride by majority of respondents, as 220 people are proud of their region and majority of respondents feel positive about wind turbines being a touristic attraction. Most people understand that efficiency of wind energy is higher than the

disturbing factors. Wind parks can be aesthetically involved in the landscape, as more than half of respondents think this way.

The common practice of how to develop wind parks as touristic attraction have not developed in Estonia yet. This research is a good basis to show that people are actually interested in opening wind parks to the public and wind energy can give tourism a good boost for it. For the further development of the thesis more questionnaires all over Estonia should be carried out.

KOKKUVÕTE

Tänapäeval on elektrienergia inimkonnale vajalik ja asendamatu. Tuuleenergia kasutamine on arenenud üha enam teaduse ja tehnika protsessi osas. Tuuleenergial on oma puudused, kuid ka eelised.

Lõputöö eesmärgiks on teada saada, kas inimesed on kohanud tuulegeneraatoreid või elavad nende lähedal. Samuti, kuidas nad veedavad vaba aega ja kas neile meeldib maastik oma piirkonnas. Eesmärgiks on välja selgitada, kas inimesed on oma piirkonna üle uhked ja kas nad arvavad, et tuulepargid on maastiku esteetiline osa. Oluline on teada, kuidas inimesed suhtuvad tuuleturbiinidesse, mis on ehitatud nende piirkonda. Samuti, kas on vajadus arendada turismi ja sellega seotud rajatisi nende piirkonnas. Kahte tuulepargi näidet näidatakse inimestele ja küsitakse, mida nad arvavad ning kas nad kujutaksid ette midagi sellist ka oma piirkonnas. Küsimustik koguaeg statistilisi andmeid inimeste arusaamadest ja arvamustest. Magistritöö tulemused jagatakse kolme osasse: Paldiski tuulepark Harjumaal, Virtsu tuulepark Läänemaal ja Narva tuulepark Ida-Virumaal.

Lõputöö teoreetiline osa annab ülevaate muutuvatest Eesti maastikest, taastuvenergiast ja kliimamuutustest seoses fossiilkütustega. Samuti kirjeldatakse tuuleenergiat, selle eeliseid ja puuduseid ning tuuleenergia mõjusid inimestele. Teoreetiline osa annab ka ülevaate tuuleenergiast ja tuule kliimast Eestis. Kuidas tuulepargid võivad olla kasulikud kohalikele kogukondadele ja kuidas seda oleks võimalik kasutada ka Eestis. Tähtis osa on ka tuuleparkide esteetikal ja ülevaatel tuuleparkide ja turismi seostest.

Uurimistulemused kinnitavad, et kaasaegset tuuleenergia tootmist on võimalik kombineerida pidevalt muutuvate Eesti maastikega. Samuti, tänapäeva tuuleenergia kuvab piirkondlikku uhkust enamike vastajate arvates, sest 220 inimest vastanutest on uhked oma piirkonna üle ja enamik vastanutest suhtuvad tuuleturbiinidesse kui turismiatraktsioonidesse hästi. Enamik inimesi saab aru, et tuuleenergia tõhusus on suurem, kui selle häirivad tegurid. Tuuleparke saab esteetiliselt kaasata maastikesse, sest rohkem kui pooled vastanutest arvavad nii. Üldine praktika, kuidas arendada tuuleparke

kui turismiatraktsioone, ei ole veel Eestis välja töötatud. See magistritöö on hea alus, et näidata, et inimesed on tegelikult huvitatud tuuleparkide avamisest avalikkusele. Samuti annab tuuleenergia turismile hea tõuke. Lõputöö edasiarendamiseks tuleks läbi viia rohkem küsitlusi kogu Eestis.

BIBLIOGRAPHY

4Energia. 2015a. Virtsu I tuulepark. https://www.4energia.ee/projektid/virtsu-i-tuulepark [03.05.2017]

4Energia. 2015b. Virtsu II tuulepark. https://www.4energia.ee/projektid/virtsu-ii-tuulepark [03.05.2017]

4Energia. 2015c. Paldiski tuulepark. https://www.4energia.ee/projektid/paldiski-tuulepark [03.05.2017]

Albrecht, C., Wagner, A., Wesselmann, K. 2013. The impact of offshore wind energy on tourism. Good practices and perspectives for the South Baltic region. German offshore wind energy foundation, Hamburg. http://www.offshore-stiftung.com/60005/Uploaded/Offshore_Stiftung%7C2013_04SBO_SOW_tourism_study_final_web.pdf [15.05.2017]

Apostol, D., Palmer, J., Pasqualetti, M., Smardon, R., Sullivan, R. 2016. The renewable energy landscape: Preserving scenic values in our sustainable future.

Arold, I., 2005. Eesti maastikud. Tartu Ülikooli Geograafia Instituut, Tartu.

Cali, Ü., Jursa, R., Lange, B., Rohrig, K., Schlögl, F. 2007. Wind power forecasting. Renewable electricity and the grid: The challenge of variability. Earthscan. London.

Chebak, A., Martin, S. 2016. Concept of educational renewable energy laboratory integrating wind, solar and biodiesel energies. Elsevier, Canada. www.sciencedirect.com/science/journal/03603199 [03.05.2017]

Ehrlich, R. 2013. Renewable energy. CRC Press, New York.

Fox, B., Flynn, D., Bryans, L., Jenkins, N., Milborrow, D., O'Malley, M., Watson, R., Anaya-Lara, O. 2007. Wind power integration, London.

Good, J., 2006. The aesthetics of wind energy. Human Ecology Review, Vol. 13, No. 1.

Hendrikson & Ko. 2012. Saare, Hiiu, Lääne ja Pärnu maakonnaplaneeringute tuuleenergeetika teemaplaneering. Olemasoleva olukorra analüüs ja teemaplaneeringu protsess ning KSH aruanne. https://energiatalgud.ee/img_auth.php/c/c8/O%C3%9C_Hendrikson_%26_Ko._Saare%2C_Hiiu%2C_L%C3%A4%C3%A4ne_ja_P%C3%A4rnu_maakonnaplaneeringute_tuuleenergeetika_teemaplaneeringud._2012.pdf [17.05.2017]

Jamasb, T. 2011. Energy, sustainability and the environment. Technology, incentives, behaviour. Elsevier, Oxford.

Jõgisaar, J., Jõgisaar K. 2013. Hanila vallavanem: Meie näeme tuuleparkides võimalust koostööks. Bioneer. http://www.bioneer.ee/eluviis/kogukond/aid-16306/Hanila-vallavanem%3A-Meie-n%C3%A4eme-tuuleparkides-v%C3%B5imalust-koost%C3%B6%C3%B6ks [09.05.2017]

Karjus, M. 2011. Tuuleparkide taluvuse kompensatsioon kohalikele kogukondadele. Pärnu. https://www.riigikogu.ee/v/failide_arhiiv/Tuulepargid.pdf [10.05.2017]

Kilki, S. 2013. Tuuleenergeetika keskkonnamõjud. Tallinna Tehnikaülikooli Tartu Kolledž. Tartu. http://www.tuuleenergia.ee/about/teadustood/ [24.05.2017]

Kokovkin, T. 2009. Kohalik hüvang tuuleparkide rajamisel. Kärdla. http://www.tuuleenergia.ee/wp-content/uploads/Kohalik_hyvang-arhipelaag1.pdf [10.05.2017]

Lang, V., 2001. Maastik ja kultuurmaastik arheoloogias. Book: Palang, H., Sooväli, H. (Toim), Maastik: loodus ja kultuur. Maastikukäsitlusi Eestis. Tartu Ülikooli Geograafia Instituut, Tartu.

Linkgreim, I.G. 2013. Eesti Rahvusringhääling. http://www.err.ee/326396/paldiskis-pandi-poorlema-18-uut-elektrituulikut [09.05.2017]

Lust, K. 2016. Narva tuhavälja tuulepark. Flickr. https://www.flickr.com/photos/blizzardfoto/30298688142 [09.05.2017]

Lynn, P. 2012. Onshore and offshore wind energy. A John Wiley & Sons Ltd, London.

Nicolini, M., Tavoni, M. 2016. Are renewable energy subsidies effective? Evidence from Europe. Renewable and Sustainable Energy Reviews. Elsevier. http://www.sciencedirect.com/science/journal/13640321 [15.04.2017]

Palang, H., 2006. Maastik – kodu inimesele, elupaik loodusele. Eesti Loodus 5. Kättesaadav: http://www.eestiloodus.ee/index.php?artikkel=1478 [10.04.2017]

Palang, H., Sooväli, H., Printsmann, A., Peil, T., Kaur, E., Lang, V., Konsa, M., Külvik, M., Alumäe, H., Sepp, K., 2005. Püsivad ja muutuvad maastikud Eestis. Kättesaadav: http://www.digar.ee/viewer/et/nlib-digar:104092/162029/page/3 [10.04.2017]

Prinsloo, F.C. 2015. Impact of renewable energy structures on tourism. Research report. https://www.researchgate.net/publication/262948582_The_impact_of_renewable_energy_structures_on_tourism [15.05.2017]

Riigi Teataja. 2004. Hanila valla arengukava aastateks 2004 kuni 2013 vastuvõtmine. https://www.riigiteataja.ee/akt/713964 [15.05.2017]

Scottish power. 2017. https://www.scottishpower.co.uk/whitelee/visitor-centre [16.05.2017]

Sepp, K., 2001. Maastik ja maastikuline lähenemine — milleks nad head on? Book: Palang, H., Sooväli, H. (Toim), Maastik: loodus ja kultuur. Maastikukäsitlusi Eestis. Tartu Ülikooli Geograafia Instituut, Tartu.

Sinijärv, U., 2001. Maastikust, kultuurist ja identiteedist. Book: Palang, H., Sooväli, H. (Toim), Maastik: loodus ja kultuur. Maastikukäsitlusi Eestis. Tartu Ülikooli Geograafia Instituut, Tartu.

Sioshansi, F.P. 2011. Energy, sustainability and the environment. Technology, incentives, behaviour. Elsevier, Oxford.

Süvirand, R. Pakri maastikukaitseala. Puhkus Eestis. http://www.puhkuseestis.ee/?id=1609&sightseeing_id=329 [09.05.2017]

The Green Britain centre. 2017. http://www.greenbritaincentre.co.uk/ [16.05.2017]

Tomson, P., 2007. Ajaloolise maakasutuse mõju Karula rahvuspargi maastike, koosluste ja kaitsekorra kujunemisele. Kättesaadav:

http://www.keskkonnaamet.ee/public/Karula_rahvuspargi_kodulehe_materjalid/MAGISTRITOO.pdf [09.04.2017]

Tõnsau, K. 2011. Tuuleenergeetika areng Eestis. Tallinna Tehnikakõrgkool Tallinn. http://www.tuuleenergia.ee/about/teadustood/ [27.04.2017]

Tuuleenergia. 2012a. Narvas valmib esimene tuhaväljale rajatud tuulepark. http://www.tuuleenergia.ee/2012/03/narvas-valmib-maailma-esimene-tuhavaljale-rajatud-tuulepark/ [24.04.2017]

Tuuleenergia. 2012b. Tuuleatlas. http://www.tuuleenergia.ee/about/statistika/tuuleatlas/ [24.04.2017]

Union of Concerned Scientists. 2013. Environmental Impacts of Wind Power. http://www.ucsusa.org/clean-energy/renewable-energy/environmental-impacts-wind-power#.WRF2Jsb-vIU

Verlis, H. 2012. Tuhaväljade tuulepargist. Horisont 1/2012. http://www.horisont.ee/node/1790 [09.05.2017]

Wind energy – The facts. 2009. Environmental impacts: Onshore impact. https://www.wind-energy-the-facts.org/onshore-impacts.html [24.04.2017]

APPENDIXES

Appendix 1. Installed wind energy in Estonia

Year	Installed wind turbines	Capacity (MW)	Number of wind turbines
	Tahkuna wind generator (decommissioned)	0,15	
2002	Virtsu I wind farm	1,8	3
	Torgu wind farm (decommissioned)	0,45	
2005	Pakri wind farm	18,4	8
	Esivere wind farm	8	4
	Läätsa wind farm	3	6
2007	Nasva wind farm	1,6	2
	Viru-Nigula wind farm	24	8
	Ruhnu (Sjustana) wind farm	0,15	2
	Sangla wind generator	0,3	1
	Türju wind generators	0,3	3
2008	Virtsu wind farm - additional wind generator	0,8	1
	Virtsu II wind farm	6,9	3
	Esivere I wind farm I stage	12	4
2009	Aulepa wind farm I stage	39	13
	Vanaküla wind farm	9	3
	Tooma I wind farm	16	8
2010	Virtsu III wind farm	6,9	3
2011	Nasva wind generator	2,3	1
	Aulepa wind farm II stage	9	3

	Aseriaru wind farm	24	8
2012	Narva wind farm	39	18
	Paldiski wind farm	45	18
	Sikassaare	1,5	3
2013	Ojaküla wind farm	6,9	3
	Nasva II wind generator	3,6	1
2014	Tamba wind farm	6,0	2
	Mäli wind farm	12,0	4
	Aburi wind farm	1,8	1
	Salme II wind farm	3,0	1
	Torgu wind generator	0,66	1
	Tooma II wind farm	7,05	3
	TOTAL	**309,96**	**139**

Appendix 2. Questionnaire form (in Estonian)

Lugupeetud küsimustiku vastaja!

Olen Eesti Maaülikooli maastikuarhitektuuri eriala viienda aasta tudeng. Koostan magistri lõputööd teemal "Piirkondliku uhkuse kuvamine ja turismiatraktsiooni võimalikkus kolme Eesti tuulepargi näitel: endises Nõukogude Liidu, kaevandusjärgses ja endises põllumajandusmaastiku tuulepargis."

Seoses sellega palun Teie abi küsimustikule vastamisega, et koostada vastavat analüüsi. Endale sobivaima vastusevariandi märkimiseks tehke vastuse ette märge või kirjutage vabas vormis vastus.

Kõik küsimustiku vastused on anonüümsed ning kasutatakse vaid selle uurimustöö osana. Küsimustele vastamine võtab aega orienteeruvalt 5 minutit.

Küsitlus on suunatud vaid Harjumaal, Ida-Virumaal või Läänemaal elavatele inimestele.

Ette tänades,

Merlin Nerep

merlin.nerep@eesti.ee

* Kohustuslik

Vanus *

- 0-18
- 19-30
- 31-50
- 50+

Elukoht *

- Harjumaa
- Ida-Virumaa
- Läänemaa

Antud piirkonnas elanud *

- Kuni 10 aastat
- 11-25 aastat

- 26-40 aastat
- Üle 40 aasta

Kas olete kohanud tuulegeneraatoreid või elate nende läheduses? *

- Jah
- Ei

Kuidas kasutate oma piirkonda, peale seal elamise või töötamise? (Märkida saab mitu vastust)

- Matkamine
- Kalapüük
- Sportimine
- Suvila
- Talupidamine (aiandus, teravilja-, kartulikasvatus jms)
- Muu

Kas Teile meeldib maastik oma piirkonnas? *

- Jah
- Ei

Kui vastasite eelmisele küsimusele "Ei", siis miks ei meeldi?

Teie vastus

Kas olete oma piirkonna üle uhke? *

- Jah
- Ei

Kas Teie piirkonnas on vajadus arendada turismi ja sellega seotud rajatisi? *

- Jah
- Ei

Kas arvate, et tuulegeneraatorid on Teie piirkonna maastiku esteetiline osa? *

- Jah
- Ei

Kuidas suhtute tuulegeneraatoritesse, mis asuvad Teie piirkonnas?

Teie vastus

Palun vaadake kahte näidist Suurbritanniast. Näidis nr 1:

Green Britain keskus - Swaffham, Suurbritannia. Külastuskeskus, kino, kohvik, teater ja pood. Ainus avalikkusele avatud tuulegeneraator, võimalus ronida üles tippu vaateplatvormile. Unikaalsed väljapanekud ja informatsioon taastuvenegiast, transpordist ja toidust. Ülesanne on teavitada, harida ja julgustada inimesi võtmaks samme rohelisema maailma poole. Harivad ekskursioonid, kus räägitakse keskkonnaprobleemidest ja maailmast meie ümber.

Näidis nr 2:

Whitelee külastuskeskus - Eaglesham, Šotimaa. Suurbritannia suurim maismaal asuv tuulepark. 215 tuulegeneraatorit, rohkem kui 130 km radasid, mida uurida jalgsi, jalgrattaga või hobusega. Interaktiivsed näitused, õppetoad, bussituurid tuulikute juurde, kohvik ja pood. Korraldatakse õpitubasid tuulegeneraatorite, taastuvenergia ja ökoloogia kohta. Samuti käed-külge tegevused, kus õpitakse tuulegeneraatoreid lähemalt tundma.

Mida arvate nendest tuuleparkidest (mis on inimestele külastuskeskustena avatud)?

Teie vastus

Kas Te kujutaksite ette midagi sellist turismiobjektina oma piirkonnas? *

- Jah
- Ei

Kui vastasite eelmisele küsimusele "Ei", siis miks?

Teie vastus

Appendix 3. Questionnaire form (in English)

Dear questionnaire respondent!

I am landscape architecture fifth year student from Estonian University of Life sciences. I'm writing master thesis on "Post-soviet, post-mining and post-agriculture landscape wind parks in Estonia: Displaying regional pride and being possible touristic attraction." and with this regard I'm asking for your help with responding to the questionnaire in order to prepare the analysis. To mark relevant answer, make a mark in front of the answer or write the answer in free format.

All replies to the questionnaire are anonymous and are only used as part of this research. Answering to the questions takes approximately 5 minutes. The survey is directed only to the people who are living in Harjumaa, Ida-Virumaa and Läänemaa.

Thanks in advance,

Merlin Nerep

merlin.nerep@eesti.ee

* Required

Age *

- 0-18
- 19-30
- 31-50
- 50+

Residence*

- Harjumaa
- Ida-Virumaa
- Läänemaa

How long have you lived in your region? *

- Until 10 years
- 11-25 years
- 26-40 years
- Over 40 years

Have you come across or do you live nearby wind energy turbines? *

- Yes
- No

How do you use your region, besides living or working there? (You can mark several answers)

- Camping
- Fishing
- Sport
- Summerhouse
- Farming
- Other

Do you like the landscape in your region? *

- Yes
- No

If you answered "No" to the previous question, then why you don't like it?

Your answer

Are you proud of your region? *

- Yes
- No

Is there a need for developing tourism and its facilities in your region? *

- Yes
- No

Do you think wind turbines are an (aesthetical) part of the landscape of your region?*

- Yes
- No

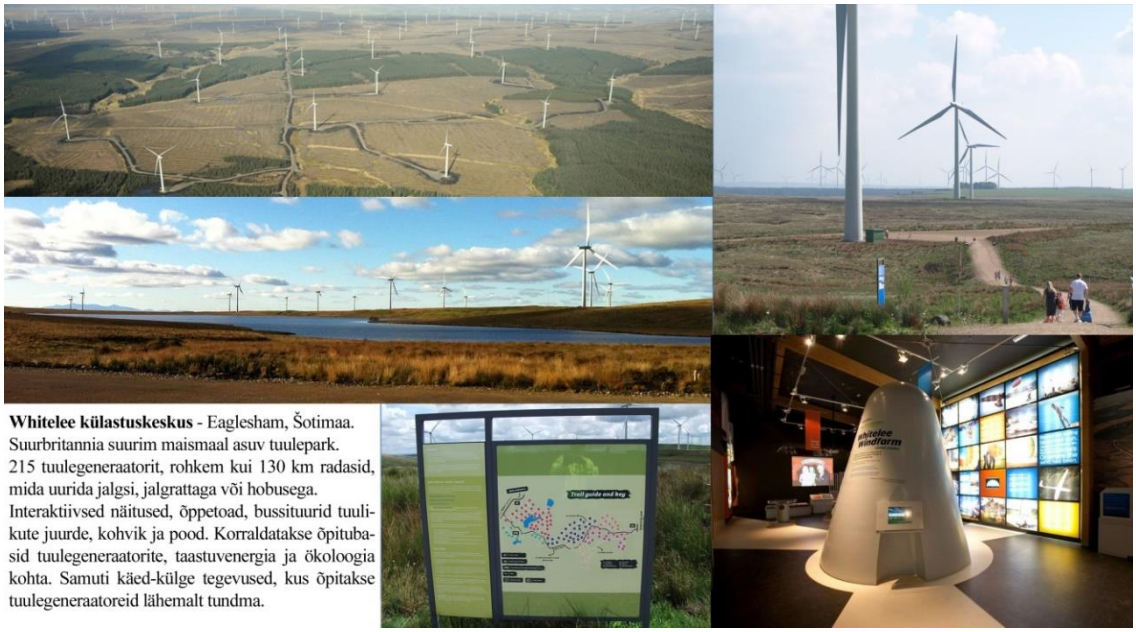
How do you feel about wind turbines that are standing in your region?

Your answer

Please take a look at these two examples from United Kingdom. Example number 1:

Green Britain keskus - Swaffham, Suurbritannia. Külastuskeskus, kino, kohvik, teater ja pood. Ainus avalikkusele avatud tuulegeneraator, võimalus ronida üles tippu vaateplatvormile. Unikaalsed väljapanekud ja informatsioon taastuvenegiast, transpordist ja toidust. Ülesanne on teavitada, harida ja julgustada inimesi võtmaks samme rohelisema maailma poole. Harivad ekskursioonid, kus räägitakse keskkonnaprobleemidest ja maailmast meie ümber.

Example number 2:



Whitelee külastuskeskus - Eaglesham, Šotimaa. Suurbritannia suurim maismaal asuv tuulepark. 215 tuulegeneraatorit, rohkem kui 130 km radasid, mida uurida jalgsi, jalgrattaga või hobusega. Interaktiivsed näitused, õppetoad, bussituurid tuulikute juurde, kohvik ja pood. Korraldatakse õpitubasid tuulegeneraatorite, taastuvenergia ja ökoloogia kohta. Samuti käed-külge tegevused, kus õpitakse tuulegeneraatoreid lähemalt tundma.

What do you think about these wind parks (which are open to the public as visitor centres)?

Your answer

Could you imagine something like this in your home region as a touristic attraction?*

- Yes
- No

If you answered "No" to the previous question, then why?

Your answer

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Hereby I, **Merlin Nerep**,

(personal ID, ……)

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The core supervisor's approval for the final thesis to be allowed for defence

This is to confirm that the final thesis is allowed for defence.

....
Supervisor's name and signature Date